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News Chronicle.

FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

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Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY: 8-10, CORPORATION ST. *Telegrams:* Autocar, Coventry. *Telephone:* Coventry 5210.

BIRMINGHAM, 2: GUILDHALL BUILDINGS, NAVIGATION ST. *Telegrams:* Autopress, Birmingham. *Telephone:* Midland 2971 (5 lines).

MANCHESTER, 3: 260, DEANSGATE. *Telegrams:* Iliffe, Manchester. *Telephone:* Blackfriars 4412.

GLASGOW, C.2: 26B, RENFIELD ST. *Telegrams:* Iliffe, Glasgow. *Telephone:* Central 4857.

Registered at the G.P.O. as a Newspaper.

No. 1827. Vol. XLIV. December 30th, 1943. Thursdays, One Shilling.

The Outlook

A Happy New Year

CHRISTMAS is over, and this issue of *Flight* comes before the public on the last day but one of the old year. For four years past the end of December has brought forth the hope and the prayer that the coming twelve months would bring Britain and her Allies near, or at least nearer, to victory and peace. In none of those years has the hope had behind it such good grounds for confidence as it has in the closing days of 1943. The "cease fire" may not actually have sounded by New Year's Eve in 1944, but the buglers will surely by then have got their brazen instruments ready to play the four notes, three short and one long, which old soldiers used to say sounded like "Let 'em alone."

What will have happened in the air by then we cannot foretell. When the Germans in the insolence and brutality of their early victories completely obliterated a village in conquered territory, they used to put up a board with a notice saying, "This was So-and-so." Perhaps a twelvemonth hence several German towns will be ripe for such a memorial. Without doubt the air blows of the Allies on the criminal country will grow heavier and heavier. That there will be tremendous clashes of armies is a certainty, and it is likewise certain that in those clashes the Allies will hold a great superiority in the air. It may well amount to air supremacy, and if that point is reached the chances of German armies being able to hold their own on the plains of Europe are small indeed. The promise has been given that the full strength of Bomber and Fighter Commands shall be at the service of the Army.

The prospects are bright, and it is with sober confidence that we wish all our readers a Happy New Year.

To Dump or Not to Dump

SINCE "Pilot, R.A.F.," propounded his query about the usefulness of jettisoning load to prolong the glide when all engines had been put out of action, we have had articles and letters galore on the subject. Mathematics have been brought in to prove or disprove the usefulness of dumping load, and as usual the mathematics have proved that they can be made to prove anything the user of them wishes them to prove.

The result has been that the discussion has grown somewhat "academic." Very simply, and without any "performing equations," the minimum gliding angle must obviously be obtained when the ratio of lift to drag is a maximum. It is, perhaps, easier to visualise this by thinking of the model in the wind tunnel. For all orthodox aircraft the maximum L/D ratio lies towards the low-speed end of the speed-range scale. If the model is tilted to a greater angle of incidence, the lift increases (unless the angle of maximum lift is exceeded), but so does the drag, and at a greater rate. If the angle is decreased, both lift and drag decrease, the lift more than the drag. The wind tunnel equivalent of dumping load is the reduction in the tunnel air speed without altering the attitude of the model. Lift and drag are decreased, but their *ratio* remains unaltered. In other words, wing loading affects the gliding *speed* but not the gliding *angle*. The real aircraft gliding in real air follows a path which is determined by the L/D ratio. If that ratio is 10 : 1 the gliding angle will be one in ten, and that is all there is to it, so far as concerns conditions of no wind.

In a wind, that is to say in a head wind or a tail wind, things are altered slightly, although only slightly, unless the ratio of aircraft gliding speed to wind speed is small

If a slow aircraft is gliding in a "howling gale," it will obviously pay to dump load in a tail wind, and not to dump in a head wind. This is because speed then enters into the problem. If the wind is blowing at 60 m.p.h. and the aircraft glides at 60 m.p.h., it will make no headway over the ground. By decreasing the angle of incidence ("putting the nose down"), the speed will go up and some headway may be made against the wind, in spite of the fact that the gliding angle is a little worse.

What all our correspondents and contributors seem to have overlooked, however, is the very practical fact that any captain of an aircraft would naturally order his crew to dump everything possible, not because mathematics tell him that is the thing to do in order to prolong the glide, but simply because by dumping he is lightening the aircraft and so reducing the touch-down speed. If he is going into "the drink," there is the extra advantage that the aircraft may float just that short time longer which will give the crew a chance to get into the dinghy.

To sum up, one might well advise crews always to dump their load unless the point aimed at lies to windward and a gale is blowing.

Sobering Thoughts

DURING its 40 years of existence (Orville Wright made the first power-driven flight at Kill Devil Hill, North Carolina, on December 17th, 1903), flying has probably suffered more harm from enthusiastic well-wishers than from its antagonists. By over-stating their claims and by ill-founded optimism, they have raised in the minds of the general public expectations which were foredoomed to disappointment, or the realisation of which was at least likely to be deferred for a good many years.

A recent case in point is the helicopter. A volume of "ballyhoo" has been raised, largely in America, which would tend to make the unsuspecting man-in-the-street think that the helicopter for all is only just around the corner.

Even in the field of ordinary orthodox aircraft there is a danger that the vast numbers of ferry flights across the Atlantic with military machines will give the impression that "there is nothing in it." Under the stress of war many risks have to be taken which would be inexcusable when carrying fare-paying passengers, and we recommend our readers to study carefully the article in this issue (pp. 720-721) by "Indicator" in which he mentions some of the difficulties still to be overcome.

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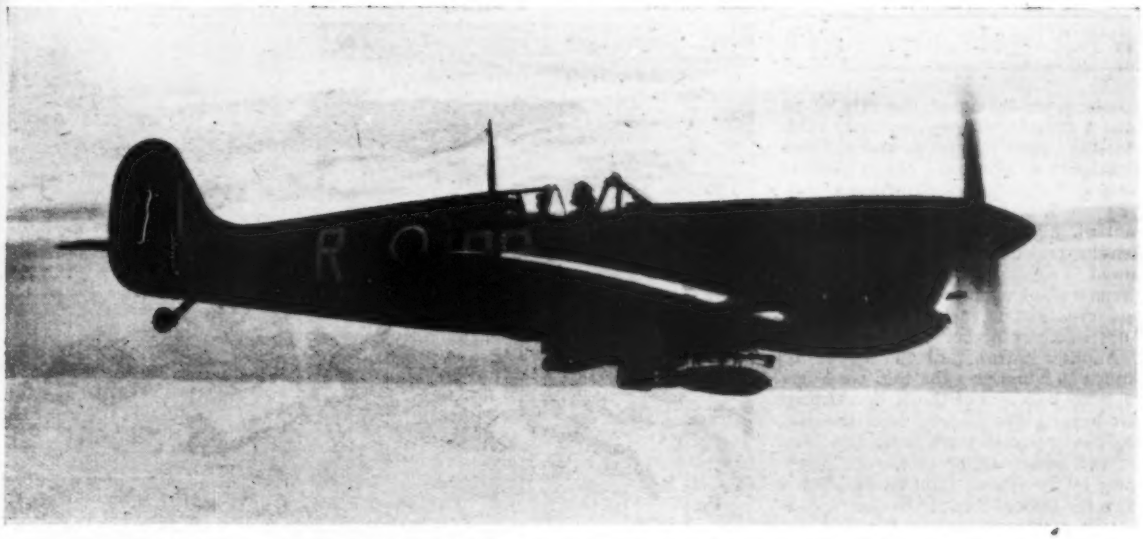
COMING UNSTUCK : Major A. G. Russell, operations chief of the U.S. 8th Air Force Ferry and Transport Service, about to take a force-landed Liberator out of a very muddy ploughed field. The machine was made as light as possible and only one man beside the pilot was on board.



Four-cannon Spitfire bombers of the S.A.A.F. over the Sangro River. One 250-lb. bomb is fitted under the fuselage, whereas the Spit-bombers operating from Malta used to carry one 250-lb. bomb under each wing.

WAR in the AIR

New Year Prospects in Germany : A Masterly Bomb Raid : A Blow at the Under-belly : Peirse Into Bangkok

Air Chief Marshal Sir Arthur Harris, Commander-in-Chief of Bomber Command, has received the following message from Sir Archibald Sinclair, Bart., the Secretary of State for Air:

"The Prime Minister, who has been receiving full details of recent operations, has asked me to convey his congratulations to crews who have taken part in the series of great battles over Berlin and Leipzig and in the associated attacks."

Air Chief Marshal Sir Arthur Harris has sent the following reply:

"Please convey to the Prime Minister our gratitude for his message and our heartfelt wishes for his speedy convalescence and return. His support, advice, and unfailing encouragement through four dark and strenuous years have been the mainspring of our effort"

IT is interesting to wonder whether any Germans will to-morrow wish each other "A Happy New Year"! They may wish it, certainly, but they can hardly expect it. The troops on the Russian front in particular will not welcome the advent of what one Tsar called General January and General February. The people at home, though better fed than those of the occupied countries, can be in scarcely more cheerful mood, with many of their chief cities laid in ruins and knowing that much more of the same sort of medicine is coming to them.

The last days of 1943 showed grim shadows of coming events. The Germans have put their trust in fighters, but have not enough of them. The wiles of Bomber Command have outwitted the defence on more than one recent occasion. After the clever feint on Berlin, which turned out to be a raid on Leipzig, there came the great double attack on the night of December 20th, when the main forces of British bombers made for Frankfort, while a second batch raided Mannheim-Ludwigshafen, and the fighters were seen scurrying about the sky from one to the other. The Frankfort raid was a masterpiece, for 2,000 tons were dropped in little more than half an hour. Many of the bombs were of the 4,000 lb. calibre, but there were also 8,000-pounders among them, and at the height of the raid the

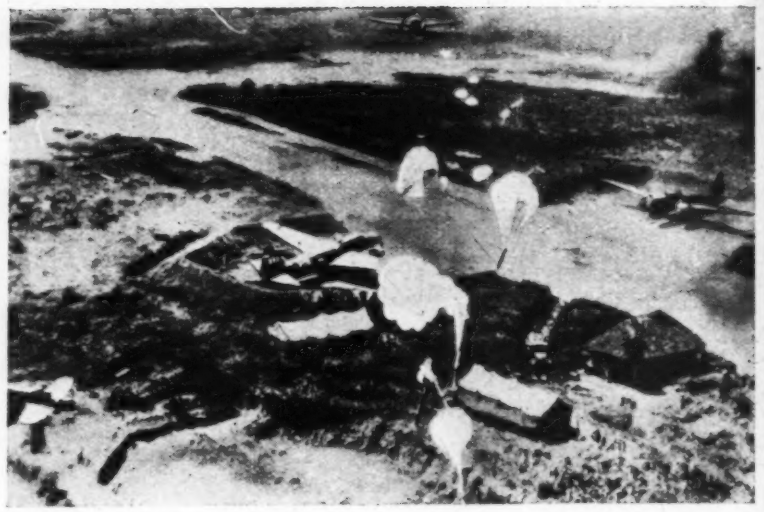
TACTICAL TWIN : An R.A.F. Baltimore of the Mediterranean Tactical Bomber Force over the 8th Army front. The Baltimore was the first aircraft to have the all-plastic nose.

WAR IN THE AIR

bombs were falling at the rate of 70 tons a minute. It was an early raid, starting before 7.30 p.m., and so those Frankforters who were not in shelters were spared the unpleasantness of getting out of bed and running for shelter in their night clothes. But after the heavies had departed, Mosquitoes followed up, and presumably set the sirens wailing again. The civil defence workers must have had a thoroughly unsatisfactory night.

Another warning of the shape of things to come was the raid on Augsburg by bombers of the N.W. African Air Force. We all remember the daring daylight raid made some time ago on the diesel engine works at Augsburg by low-flying Lancasters. Since then the U-boat menace has been practically mastered for the time being, but it never does to let the Germans get their remarkable powers of repair to work for long on any important target. Augsburg can now be bombed from the "under-belly," and that marks a new turn in the war.

Added to all that, the U.S. Eighth Air Force is pressing further and further into Germany by day. It will be remembered that when General Arnold was in England last summer he said in an interview that he was only interested in one class of fighter, namely the escort fighter, and he thought the Lightning and the Thunderbolt filled that bill. At the height at which Fortresses fly they seem to feel that *flak* will not do them much harm, but (despite their formidable armament of heavy machine guns) they evidently have to pay some attention to the fighters which the Germans send up against them, and like a fighter escort. In a raid on Bremen before Christmas the Fortresses and Liberators, over 500 in number, dropped about 1,200 tons of bombs, and were escorted by the largest number of fighters that the Americans have ever sent out. The growing power of the Americans to hit Germany hard is another fact which will not make the New Year thoughts of the modern Huns any more sweet and hopeful.



EXPLOSIVE THISTLEDOWN : U.S. Fifth Air Force aircraft dropping parachute bombs on the dispersal points of the Japanese-held Vunakanau airfield. Parachute bombs are used to enable the aircraft to get clear before the explosion. The machines on the ground are Mitsubishis OB-01.

Aircraft in Russia

THE great Russian attack on the Nevel front in northern White Russia has been accompanied by greater air activity than is often reported from Russia. The season is late all over Russia, but the ground is hardened by frost in the northern sectors, while mud still limits movement in the south. South of Nevel the assaulting Russians were given ample air support, and in one engagement 100 Stormoviks bombed and machine-gunned the German strong points with marked effect. The Red aircraft have also been playing the part once played by cavalry by pursuing the retreating enemy and cutting them up. In one day they destroyed 150 German lorries.

The Germans also have concentrated considerable air strength on that front, and the *Luftwaffe* has been trying to hold back the Russian advance. The numbers reported as engaged, however, do not compare with air strengths in the West and in the Mediterrancan. Correspondents report that German groups of 30 to 40 bombers with fighter escorts were frequently seen, and that on a certain occasion the sky over the battlefield was full for half a day of 270 aircraft from both sides fighting a series of engagements. These numbers seemed to strike the observers as unusually large.

We all know that the Germans have left their bombers on the Russian front with a force of fighters which is very inadequate according to R.A.F. ideas, and the Russians ought to be superior in that all-important branch of the air arm. At the same time German fighters have not been making much of a showing in Italy. Only in attempts to resist the bomber offensive from Britain do German fighters appear regularly in numbers, and though they shoot down a certain number of British and American bombers they do not achieve their object of saving the cities from the bombs.

POSITIONING FOR ATTACK : A Douglas Dauntless, with a 1,000-lb. bomb slung in the ejector arms, prepares to dive-bomb a target on Wake Island.

Eastern Air Command Busy

THE newly-formed Eastern Air Command in India wasted no time before making itself felt. Air Chief Mar-

WAR IN THE AIR

THEIR SEVENTH YEAR OF WAR : Chinese airmen being briefed before take-off. In the background is a Russian-built S.B.2 bomber.

shal Peirse promptly despatched a force to bomb Bangkok, the capital of the miserable little Japanese satellite, Siam—or Thailand, as it likes to call itself. The distance from the Assam border is some 800 miles, over very rugged country which has in the past been a great ordeal to those adventurous solo airmen who were constantly striving to cut down the record time between England and Australia by a few hours.

Bangkok is a place of some aeronautical importance, and it used to be a stage on the Imperial Airways route to the East.

Air Chief Marshal Peirse emphasised the character of the new Command by sending out both American and R.A.F. bombers to make a combined attack on Bangkok. A strong American force bombed the harbour, while R.A.F. machines simultaneously went for the arsenal area of the city.

The End of 1943

THE weather in Italy has seriously curtailed air operations during the last fortnight or so. Nevertheless, machines of the Tactical Air Force have contrived to fly and to give support to the two Allied Armies in their stern battles in the rain, mud and mountains. Fighter-bombers and light bombers have received particular mention, and they deserve great credit for having got into the air at all. They played their part in the stiff fight for Ortona on the front of the Eighth Army. No report has come in to enlighten us as to how much damage they actually did to the German strong points, but one knows that it always encourages troops to see their own aircraft overhead. The Germans used parachute troops as infantry in defence.

Well if the doddering old fool can't see any difference between a king and a jack, he can just take his pitchfork and get to hell out of here.

IN THE ANTIPODES : A Yorkshireman overhauling a Spitfire in North Australia. He belongs to one of the oldest squadrons in the R.A.F. It was formed at Birmingham as a unit of the Royal Flying Corps in May, 1916.

The Battle of Berlin has continued, and in the early hours of December 24th Bomber Command made yet another attack on the German Capital. The Germans report that their fighters have adopted new tactics, flying alongside the British bombers, whose gunners are then hampered by the fear of hitting their own machines. This is a result of the saturation tactics, whereby hundreds of bombers have to unload their bombs in half an hour. They are naturally close together.

To end the year's accounts of War in the Air, *Flight* pays tribute to R.A.F. Transport Command. For some time past machines of this Command, together with those of British Overseas Airways, have been daily delivering thousands of pounds of Christmas mail to the troops across the water. A regular mail service has been maintained to all zones of war, with main distributing centres in North Africa, the Middle East, India, Sicily, Italy, West Africa (where there is a contingent of the R.A.F. engaged in the Battle of the Atlantic), Malta and the Azores. Within a fortnight of the British occupation of the bases in the Azores about 4,000 lb. of mails were delivered here. North Africa and the Middle East naturally get the heaviest consignments, and in November these two zones received a total of more than 38,000 lb. of mails.

HERE AND THERE

Polish Civil Aviation

IN connection with work on the reconstruction and future development of Polish civil aviation, the Polish Ministry of Industry, Commerce and Shipping has established a special department to deal with all the problems concerning air transport. The offices of this Aeronautical Department are at 157, Victoria Street, London, S.W.1.

Canadian-built Mosquitoes

IT may now be revealed that Canadian-built Mosquito bombers, flight-delivered across the Atlantic, have been in action in Europe during December. The first sortie was an honourable one, Berlin being the target.

Deliveries of Mosquitoes from the de Havilland Canadian factory earlier this year have mainly been absorbed in North America by the Royal Canadian Air Force and the U.S. Army Air Forces.

Bolivian Air Mission

AN air mission from Bolivia recently arrived in this country for a tour of R.A.F. stations. Its leader is Lt.-Col. Jorge Jordan, his companions being Lt.-Col. Antonio Rivera and Major Rodolfo Carcia Agreda.

Representatives of the Air Ministry and the Bolivian Chargé d'Affaires, Señor Donjuan Penaranda, met the three officers on their arrival.

Britain-Sweden Airline Talks

NEGOTIATIONS are taking place through the Swedish Foreign Office with the German authorities concerned for guarantees to enable air traffic between Sweden and Britain to be resumed, said a Stockholm dispatch to the Norwegian Telegraph Agency, quoted by Reuter recently.

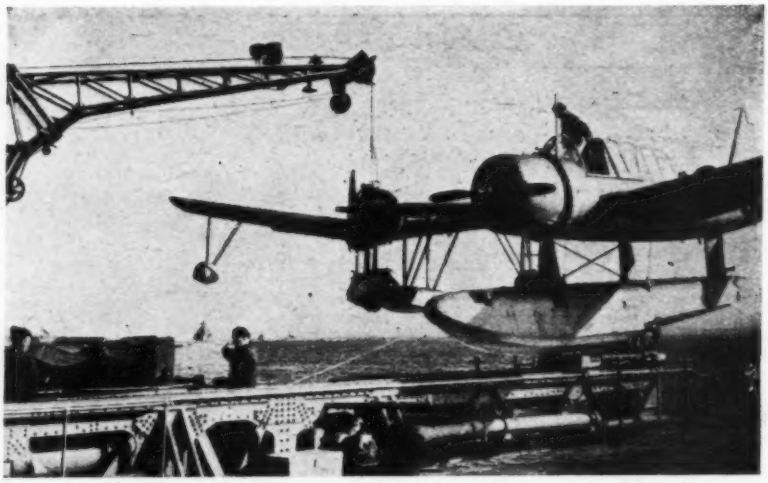
Air traffic between the two countries was suspended in October after the shooting down of a Swedish transport aircraft on its way from Britain to Sweden. Thirteen people were killed.

Praise for the Ju 88

MAX KARANT, managing editor of our American contemporary, *Flying*, describes in the November issue of his journal his impressions gained on a recent month's visit to this country during which he was allowed to visit the M.A.P. experimental base which he describes as "England's counterpart of our Wright Field."

Among captured German aircraft in flying condition he inspected was a Junkers Ju 88 night fighter, and in the course of his article he says that R.A.F. experts have a great deal of admiration for this machine.

"One test pilot," he says, "told me the Ju 88, in his opinion, is the finest flying airplane he'd ever flown."



BOYS IN KINGFISHER BLUE: The U.S. Navy "task force" serving with the British Home Fleet is equipped with Vought Kingfisher observation and reconnaissance aircraft. Powered by a 400 h.p. Pratt and Whitney Wasp Junior, it has a top speed of 171 m.p.h., is catapult launched, and hoisted on board after landing in the "slick" alongside its parent ship.

Trouble Brewing

A PRELIMINARY report by the Naval Affairs Sub-Committee of the U.S. House of Representatives has asked that what it calls "appropriate criminal action" shall be taken by the Government in connection with alleged failures of the Brewster Aeronautical Corporation.

The report urged the Government to take such action "as may be appropriate upon the evidence contained in the record of the committee's proceedings, indicating the commission of fraud, sabotage, and other criminal offences."

Brewster factories have been the scene of recent strikes and other stoppages, and as long ago as April, 1942, the U.S. Navy took over three of their plants for a month on President Roosevelt's orders because of "dissatisfaction with the management."

Box Scores

UNDER the title of "Box Scores of American Combat Aircraft," the November issue of U.S. *Air Services* tabulates some instructive figures on the respective losses of their own and enemy aircraft.

The grand total from "Pearl Harbour" to September 1st, 1943, shows a loss of 1,867 American aircraft as against 7,312 enemy machines, giving a ratio of nearly four to one. Of these, however, 1,239 and 5,389 respectively were incurred after March 1st of this year, during which period the proportion improved to more than four to one.

LIKE FATHER: Mr. J. W. S. Brancker, newly appointed Traffic Director of British Overseas Airways, wears a monocle just like his famous father, the late Sir Sefton Brancker, whose flashing eyeglass was almost part of himself.

In the month of July last, the Eighth U.S. Air Force based in Britain lost 108 Flying Fortresses in the process of dropping 3,600 tons of bombs on the enemy, but shot down 500 German fighters—an exchange rate still better than four to one for our Allies.

In the North Solomons, during the first ten days of the June offensive, the exchange rate was over five to one for the U.S. Navy against the Japs, while the 14th U.S. Air Force in China, between July, 1942, and August, 1943, ran up the heartening score of nearly nine to one against the Japs.

Good show, boys!

"Luftwaffe" Losses

ENORMOUS losses inflicted on the *Luftwaffe* in Russia are detailed in a recent article in *Red Star*, the Soviet Army newspaper.

In the summer campaign, it says, the Germans lost over 10,000 aircraft, which is more than a third of their annual output in its heyday. Altogether the *Luftwaffe* has lost between 25,000 and 30,000 pilots and navigators killed on the Russian front, and so they now have to send young and inexperienced airmen into action. Moreover, not a single new type of aircraft has appeared at the front.

"We don't speak of German air superiority at this stage of the war," a captured commander is quoted as saying.

Air Chief's Tour

AIR CHIEF MARSHAL SIR RICHARD PEIRSE, the newly appointed A.O.C.-in-C. South-East Asia Command, recently flew in his own aircraft from New Delhi to the Burma border to visit the forward battle areas.

He was accompanied by Air Marshal Sir John Baldwin, former Deputy A.O.C. India, and together they inspected a number of dive-bomber and fighter squadrons, including an Indian squadron which has been in action against the Japs in Burma, and the famous "Mohawk Squadron" which has been operating so successfully in support of ground troops in the Fort White area.

RETURN TO "E" LIBRARY

Coastal Command

SILVER WINGS IN THE SUNLIGHT.—A Flying Fortress II (B-17E) of Coastal Command, characteristically white except for a darker shade on top, crosses the coastline as she sets out on patrol.

The "Eyes of Britain" Scan 5,500,000 Square Miles of Ocean: Endless Vigil of the U-boat Hunters

IN the unending battle against the U-boats, the aircraft of Coastal Command play a part the importance of which it would be difficult to exaggerate. And the heartening fact that this battle is now well on the way to being won is due in very considerable measure to the vigilance, endurance, and courage of the pilots and aircrews who are making life increasingly unpleasant (to put it mildly) for those who man the German submarines.

The degree of glamour and excitement which the airmen of "Coastal" enjoy is small compared to that of Bomber and Fighter Commands, and smaller still compared with the long hours of patrol and escort duties when nothing happens to relieve the monotony—as one pilot once put it, "Flying with Coastal Command is just one damn 'recco' after another." But it must not be thought that their job consists of nothing but reconnaissance.

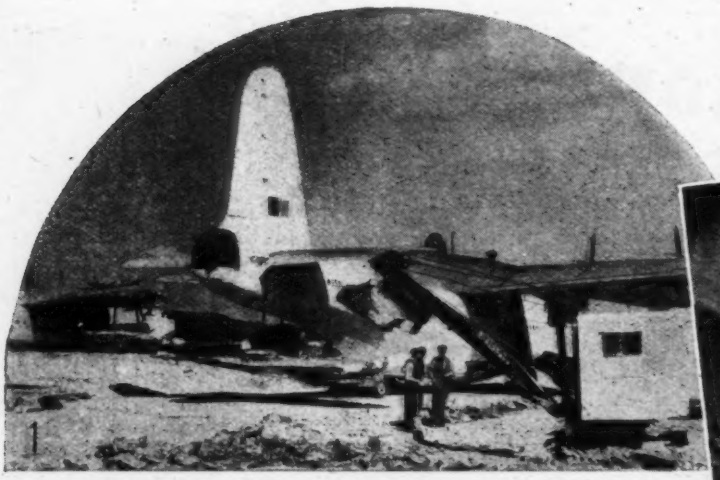
From the earliest days of the war, "Coastal's" striking force has co-operated with Bomber Command, its Hudsons and Beauforts taking part in the first real bombing raids on enemy territory. At Dunkirk even the Anson played the role of fighter (and actually broke up German formations bent on attacking the "little ships") when the then slender resources of Coastal Command were stretched to give what protection it could. France fell and the Battle of the Atlantic raged in grim earnest. The flying boats and landplanes of "Coastal" flew above the threatened convoys, watching for, and attacking the prowling U-boats and the long-range Focke-Wulf Condors that directed them. The Beaufighter added still more strength to the ever increasing punch of the striking force and, with the Beaufort and the Hudson, purged the English Channel of enemy invasion preparations, and made the Bay of Biscay decidedly unhealthy for marauding Ju 88s.

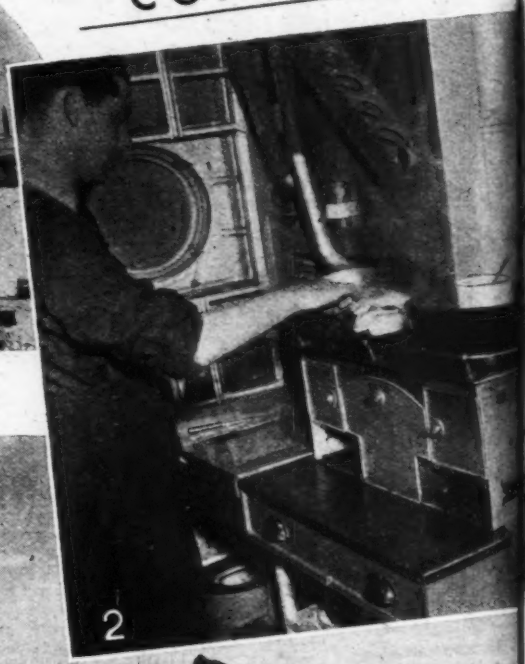
Gradually the strength of Coastal Command grew until now it covers the seas from the Arctic to the Equator, and from Norway to mid-Atlantic. Though a command of the R.A.F., it has been, since early in 1941, under the operational control of the Admiralty, with whom it works in close relationship. It is the largest user of American aircraft in the R.A.F., its original Hudsons

(Above) Sunderlands awaiting their next patrol, moored in sheltered waters.

(Right) Sailing is a popular pastime with crews when off-duty.

COASTAL CO

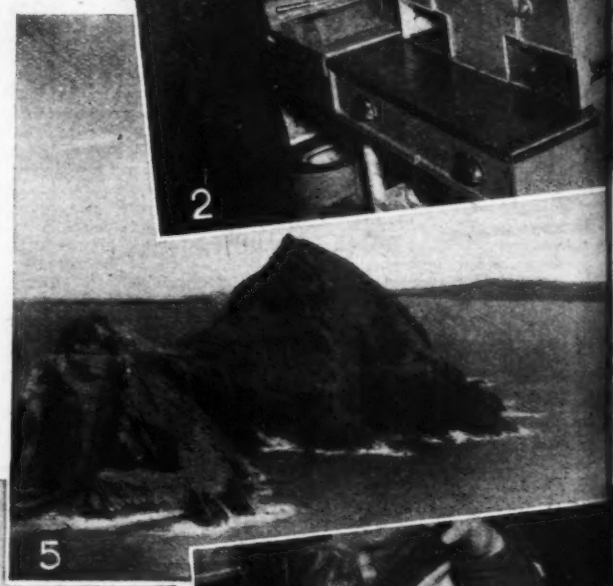




1. A Sunderland on the slipway of a new base where construction work is still unfinished. 2. An air-gunner acts as cook during a 15-hour patrol in a Sunderland flying boat.

having at subsequent stages been augmented by Catalinas, Liberators, Venturas and Flying Fortresses. British types on its strength include, besides several landplane types such as the Beaufighter, Beaufort, Blenheim and Wellington, the unbiquitous Sunderland flying-boat, whose main job, like that of the "Cat," is the ceaseless patrolling of the seaways; Catalinas, with their 4,000 miles range, can stay in the air for more than 20 hours.

Coastal Command has aptly been described as "the eyes of Britain," and its Command Headquarters boasts what is probably the largest Situation Map used in any theatre of operations. It measures 30ft. by 30ft., and across it stretch coloured tapes radiating from the British Isles. These, and the large blackboards which are continually revised, give complete information of the position of British and enemy forces at sea, and of aircraft movements over the 5,500,000 square miles of sea which Coastal Command patrols, striking at the enemy whenever it finds him.



7. The tedium of flying long hours on a predetermined course is relieved by handing over the controls to "George," the automatic pilot, when the captain of the aircraft is freed to do other things.

COAND

3. Members of the flying-boat crew take their meals in turn, relieving one another at their posts, so that vigilance is never for a moment relaxed.

4. A " Waaf " operator at Command H.Q., slung in her safety harness as she makes adjustments to the huge Situation Map measuring 30ft. square. Friction pulleys enable her to jump down from the step-ladder, thus saving time and energy. 6. The navigator of a Coastal Command Flying Fortress takes a drift sight : the " wind lanes " over the water, visible from almost any height, provide a useful check in mid-ocean.

A rugged
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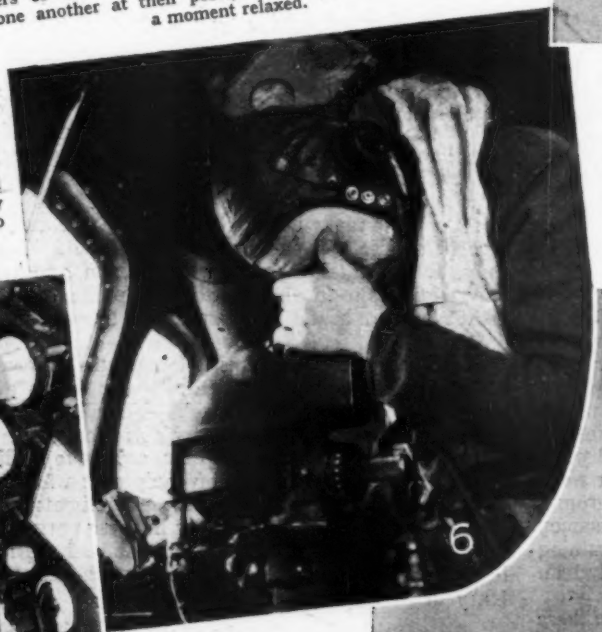
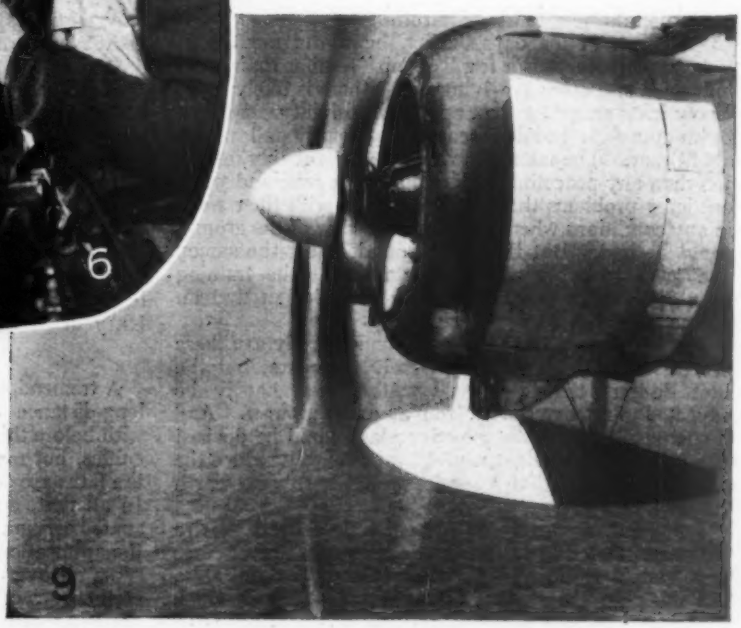


8. The wireless operator is a busy man throughout patrol, receiving instructions from base and reporting progress or activity if any. 9. Only the hour-after-hour reliability of the modern aircraft engine makes all this possible—in this case Bristols.



"Indicator" Discusses Topics of the Day

No Great Expectations

"De-educating" the Ordinary Person : Difficulties Which Still Have to be Overcome in Airline Operation : The Dangers of Over-optimism : Future Cruising Speeds

EVERYBODY in this world, whether expecting to make any use of it or not, believes in the future of air transport, but only a very small percentage—and all, so to speak, in the business—really know anything about the technical and operational difficulties which have still to be overcome. I never have believed it to be a good thing to leave the average person (who is the passenger of the future) in glowing and optimistic ignorance of these difficulties. Admittedly, the average person can do nothing to solve the various problems involved, and from some points of view it might almost be better to leave that person in a happy, optimistic state, but, all in all, it is really better that everyone should know the worst as well as the best.

If this apocryphal man-in-the-street is told everything possible he will not expect too much, and will not, consequently, be disappointed. He will be realistic and not downcast when the 10.20 to Paris fails to leave according to schedule; and he will be able to judge for himself just when and why an airline, or a chartered aircraft, will be really useful to him. No operator or operator's traffic clerk likes the job of telling some furious passenger exactly why such-and-such a service has been cancelled. If he is told vaguely that the weather is too bad he becomes inquisitive; if he is told about fog, he wants to know where all this blind-flying business has got to; and if he is told about icing conditions, he may become very knowledgeable about de-icers. He must be fully informed before as far as possible about all the difficulties. And now is the time.

Even Instructors Grounded

Let us take just that one natural hazard—icing. On 50 per cent. of the days during the winter months in Europe when there is a fog "clamp"—other than mere industrial and other low-lying mist—there is likely to be heavy icing as well as bad approach visibility. Service beam-approach training centres can easily tell us all about that. The instructors are better, probably, at the job than any peacetime airline pilot ever was, and without icing problems they could carry on with their work in any conditions where a last-minute view of the ground could be had. But they are grounded just the same; and it is probably more important that the training should, if at all possible, be carried on, than that an airline should run to schedule.

But my apocryphal fellow will undoubtedly say there are de-icers, aren't there? Surely there are, but the best de-icers that can be visualised can hardly be expected to remove the ice from an entire aircraft. And if such a phenomenally effective plant could be devised and installed, its weight would so thoroughly reduce the effective payload that a service would hardly be worth running.

I remember once being aboard a Lockheed Electra when ice started to form; the de-icers and slinger rings were put to work, and did their jobs quite admirably, but the poor old aircraft vibrated and shook so much that one wondered which part of it would fly off first. The ice *had* been removed from the essential parts, but it remained in chunks here and there—and these chunks thoroughly upset the airflow.

Quite apart from an occasional out-of-balance airscrew shudder, as one or other of the blades freed itself from the deposit before the fluid had managed to do its work on the others, there were very strange developments from the coatings on such items as aerial masts, and fairleads and mass-balances. Until every bit had come away in a cacophony of nerve-shattering sounds, that aircraft just was not in very good running order. And the icing was quite moderate that time. In Central Europe, occasionally, with rain in super-cooled droplet form, the rate of formation can be quite prodigious.

Enemy Number One

It will, of course, be beaten in the end, but ice-formation will, for quite a few years, be one of the prime reasons for airline cancellations in Europe and across the North Atlantic. So let the ordinary person know it, and he or she will not then be upset or disappointed or superior.

And what about a little layer of hoar frost? It looks quite pretty, but an aircraft which will fly, ponderously, perhaps, but still fly, with half a ton of clear ice on the leading edges and elsewhere, just will not take the air at all with such a little white frost deposit. Don't ask me why; something to do with the boundary layer and the effect on the airflow of all the tiny little crystals which make up the formation. Only a thermal type of de-icer will effectively cope with it. Fortunately, hoar frost takes quite a while to form, and usually only does so on an aircraft which is parked out overnight, so a pre-heater van can be put to work in good time.

Then there are tremendous differences in temperature and climatic conditions to be dealt with on an airline running half across the world. There are tropical storms, and sand, and sea-water corrosion to be considered. An aircraft rigged up for, and fit to fly in the tropics, carries a whole lot of equipment which is so much useless dead weight in temperate climates; while the machine which is satisfactory in these parts (and is complete with thermal de-icer plant and all the rest of it) will be an incipient forced-landing-case-for-Queen-Mary in North Africa.

Overheads

A tremendous amount of the organisation involved in long-distance airline operation was successfully dealt with before this war, and there were no insuperable difficulties, but my man-in-the-street may like to know why the fares are so high—and here are some of the reasons. In all that, and in the cost of airfield maintenance, of spare-carrying at the different intermediate points, and the application of contented man-power in God-forsaken spots all over the world. Aircraft, by the very nature of their structure and equipment, are mildly unreliable devices, even with the best maintenance in the world,

NO GREAT EXPECTATIONS

and the service must always go through. If the "turn-over" is sufficiently large—and it will be in due time—then all the myriad overhead costs will go down and down, and eventually, perhaps, we shall have an aeronautical Utopia. But not yet, and the ordinary person must rest his soul in patience, and put up with delays and disappointments for the sake of increased speed of transport in the long meantime before the Utopia arrives.

Prospective airline speeds, too, have been grossly over-prophesied. There is no object at all in telling my little man that he is going to travel about at three hundred miles an hour, because he won't. With the increased efficiency of engines, and blowers, and aircraft shapes, economical cruising speeds will undoubtedly be higher than they were five years ago, but they still won't be much in excess of 200 m.p.h. until the time has come to fly at stratospheric heights with jets, pressure cabins, and all the rest of it.

The speeds generally quoted even for uneconomical military machines are those for optimum altitude—generally between 20,000 and 30,000ft.—and nobody is going to tell me that my great-aunt Matilda is going to like flying to Vienna at that sort of height with an oxygen mask, fur boots, and probably a pair of consequently broken ear-drums. With a pressure cabin, yes, but not until such an arrangement is entirely reliable, and then only over distances greater than a thousand miles.

Everything will all come in due course, but for quite a few years hence we are going to plod about the sky at comparatively sober speeds and probably in converted bombers—and very much converted they will need to be. Meanwhile, if it is considered necessary and feasible for the mail to go through very quickly indeed, there *will* be certain very fast high-altitude services. The crews will be used to the conditions and to the paraphernalia involved, and, if any, only passengers of a staunch and specially selected kind will travel with the mail. And they'll probably be carried away daily in stretchers after failing to remember their instructions; the ex-Pathfinder crews will get a good laugh out of that.

None of it matters so very much. Our forefathers were happy enough in their dog-carts and with their musical evenings, and to very few people is it really important that a couple of hours should be saved. Mental and physical comfort are the things that matter in travel, and they must be provided at whatever cost to aeronautical prestige and advertised speeds. The human race, anyway, hasn't yet learnt what to do with a couple of hours; more often than not they'll merely provide extra drinking time at the Terminal Hotel.

The day after to-morrow is another day. To-morrow never is.

"INDICATOR."

AMERICA'S NEW BOMBERS

FROM information which has appeared in the American Press it is now possible to give more specific details of the new B.29 bomber, already referred to in *Flight* of October 21st, 1943.

There is no doubt that this new four-engined aircraft will mark a real achievement in American aircraft progress. With its bomb load of 16,500 lb. to 17,500 lb. on a 1,000 miles' range, or 6,000 lb. on a 3,000 miles' range, the B.29 is far superior to Fortress types at present in service; it signals the realisation of the policy of increased effective bomb load of operational aircraft.

The B.29 retains the general features of the Fortress and is fitted with a tricycle undercarriage, all undercarriage wheels having double tyres.

The span of the aircraft is 141ft., length 99ft. and the wing area 1,739 sq. ft. Powered with four Wright Cyclone Duplex engines of 2,000 h.p., each driving a three-bladed airscrew, the B.29 has a cruising speed of approximately 250 m.p.h. at 25,000ft.

Heavily armoured, the aircraft carries a considerable armament, comprising a chin turret, as on the B.17G, dorsal, ball and tail turrets, and barbettes on each side of the fuselage operated by remote control.

It will be recalled that the B.17G has chin, dorsal, ball and tail turrets and nose and waist gun positions, all equipped with 0.5 calibre guns. It is possible that the armament of the B.29 will include cannon.

The all-up weight of the new bomber is between 100,000 and 120,000 lb., presumably varying with equipment, as compared with the 60,000 lb. of the Fortress or the Lancaster.

It was the improved bomb-load capacity of the B.29, as compared with the Fortress, to which Gen. H. H. Arnold, Commanding Officer of the U.S. Army Air Forces, referred when, in an official statement, he announced that when the B.29 enters combat to-day's heavy bombers will become light-heavies.

How soon the B.29 will appear in the battle skies of Europe or the Pacific is impossible to predict, but on November 2nd Gen. Arnold mentioned that the "final test of the B.29 is not now far distant." It will, of course, operate only from established bases.

BOOK REVIEWS

1,000 Questions and Answers for A.T.C. Cadets, by Eric De Ville; M.A., B.Sc. Hutchinson, 2s. 6d.

SPLIT up into ten chapters under their various subjects, such as aircraft, theory of flight, instruments, engines, navigation, etc., this imposing collection of 1,000 questions and answers forms a very useful little handbook for the enthusiastic A.T.C. cadet to carry in his pocket.

Obviously intended for easy reference and rapid revision work in the course of his studies, one can imagine it no less handy for settling those innumerable arguments which cadets thrive upon whenever they foregather. Of course, the information contained cannot be absolutely exhaustive, but by the time any cadet literally knows all the answers, he will probably be an Air Marshal!

Aircrew Exercises for the Air Training Corps, by the Rolls House Publishing Co., Ltd., for the Air League of the British Empire. 1s.

WITH a foreword by Mr. W. W. Wakefield, who is primarily responsible for its appearance, this is another little booklet for the libraries of the A.T.C. But it is for squadron use rather than for the individual cadet. It contains a collection of what are really games—outdoor and indoor—the nature of which provide the players with useful practice in such important matters as navigation and aircrew teamwork. All of them were submitted, at the request of Mr. Wakefield, by various A.T.C. squadrons up and down the country, or by individuals. In fact, it was after encountering so many original ideas for combining instruction with entertainment during his visits to squadrons that Mr. Wakefield decided it would be a good idea to have a representative selection of them published in booklet form for the benefit of the Corps as a whole.

Air Navigation, by I. R. Vesselo, B.Sc. Hutchinsons, 2s. 6d.

THIS is No. 3 in the "Complete Air Training Course" series of the publishers' scientific and technical section, and as such assumes an adequate knowledge of the mathematics and general science principles involved. Pointing out in the preface that there have been many adjustments and improvements in navigational methods in recent years, the book deals with its subject in accordance with modern practice and is intended to provide the beginner with a sound basis for that skill which will come of actual practice in the air. It includes an important section on the stars, with star charts.

Eighty-first of the Current Recognition Series

Aircraft Types and h

RYAN PT–25

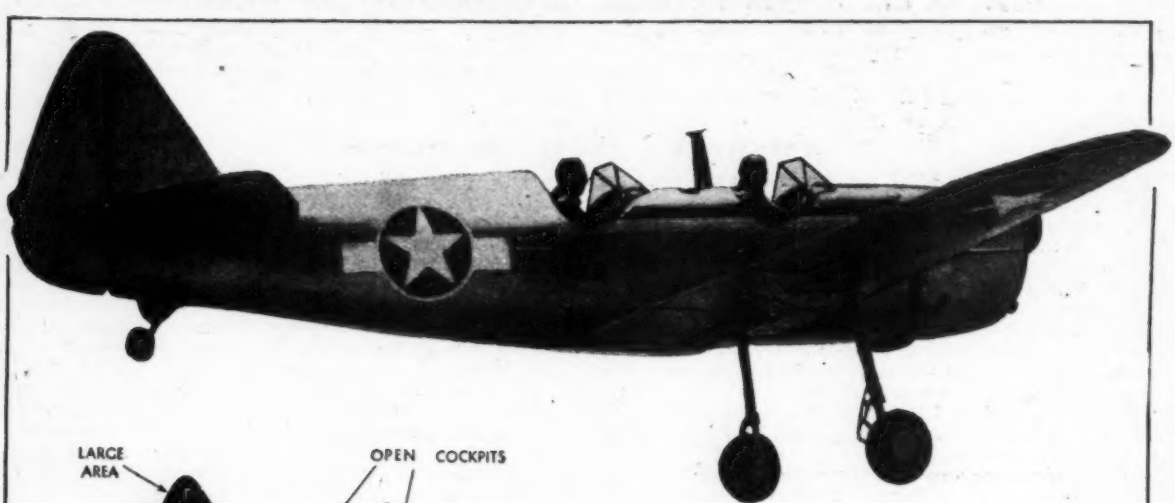
FROM the time the Ryan PT-25 was introduced in 1942, until comparatively recent months, it could be (and in fact, was) described as being built of "non-strategic" materials. Its predecessor, the Ryan PT-22, was a metal aircraft, and the U.S. authorities asked its makers to produce a trainer of wood or plastic materials because aluminium and steel would have to be conserved for combat types.

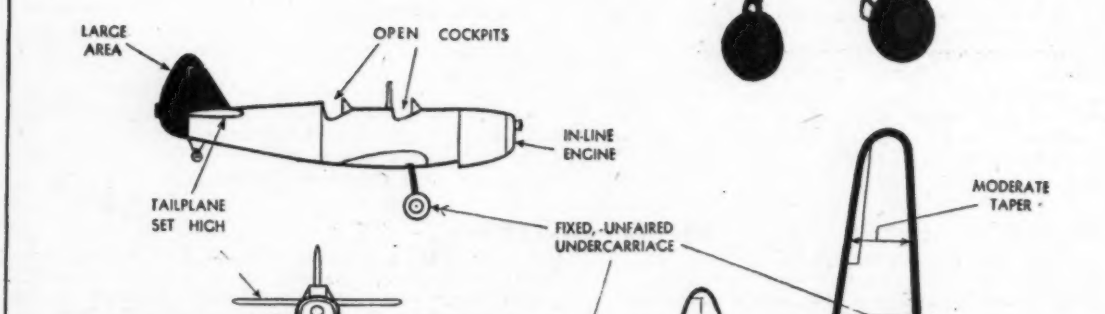
From recent reports from America, however, it is fairly clear that wood has become as "strategic" as metal.

But be that as it may, the Ryan PT-25, whose airframe is all wood, plywood and fabric except for the cowling, engine firewall and sundry minor fittings, is now the standard production trainer. What is just as important from the pupil pilot's point of view, its performance is better than that of the metal PT-22. This is due not only to its more powerful 175 h.p. "flat four" Lycoming engine with two-bladed v.p. airscrew (as opposed to the 125 h.p. 5-cyl. Kinner radial of the PT-22), but also to the much greater aerodynamic cleanliness of the design. The PT-25 is, incidentally, the first Ryan trainer to employ full cantilever wings and undercarriage, to get rid of external struts and wire bracing.

The tapered wings are of the single spar type, and the plywood-covered leading-edge section forms a nose torque box. Aft of the main spar the wing is fabric-covered. The fuselage (open tandem cockpits) is an oval-section wooden structure with stressed plywood skin, and the cantilever tail unit has plywood-covered fixed surfaces and fabric-covered rudder and elevators, the horizontal surfaces being set ahead of the fin and rudder. An air-brake, very similar to that of the D.H. Moth Minor, is fitted under the centre-section. It is, however, electrically operated.

Top speed is 149 m.p.h. at sea level, cruising speed 134 m.p.h., service ceiling 20,300ft. and range 378 miles at normal operating speed.



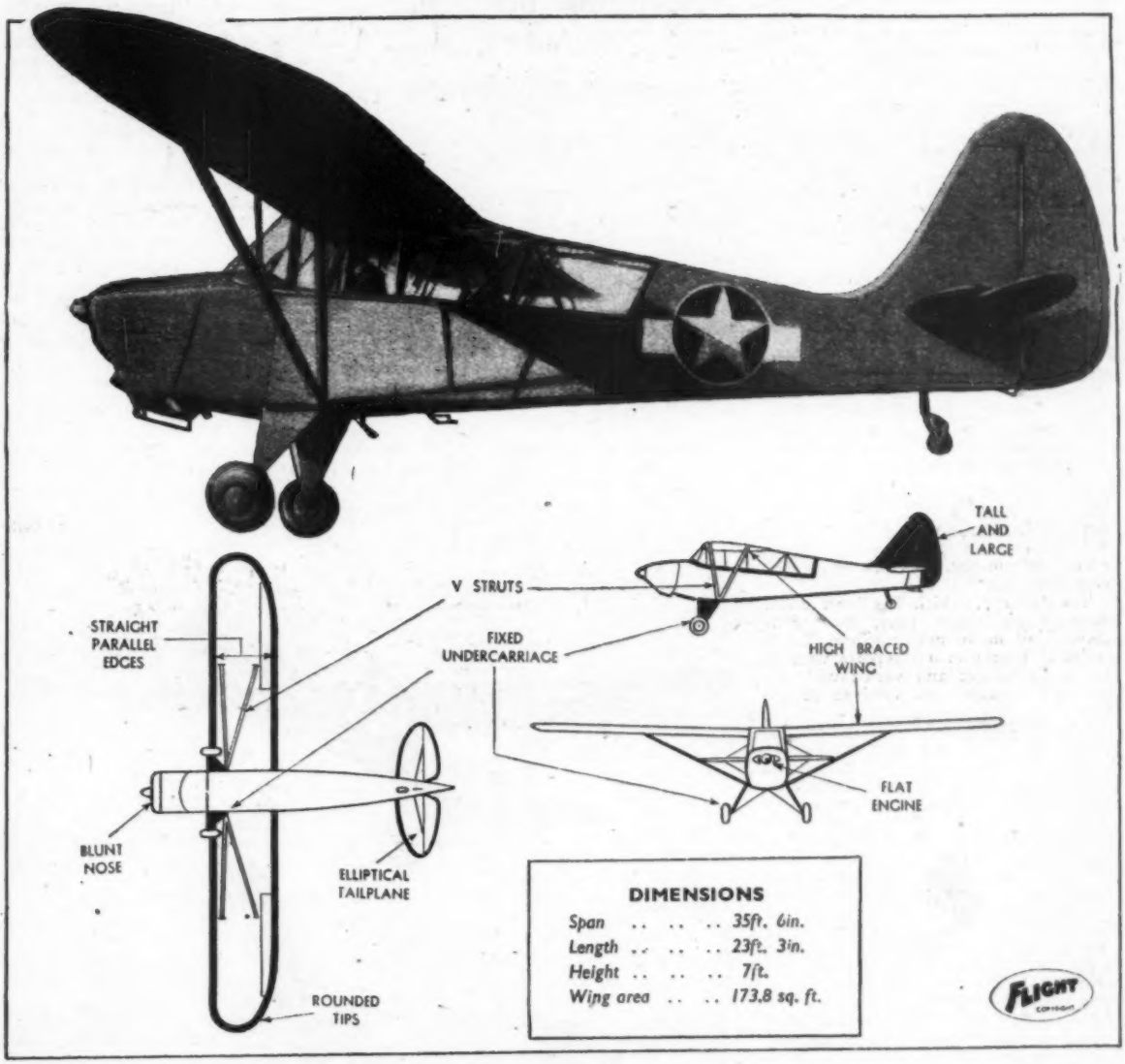


DIMENSIONS

Span	*32ft. 10in.*
Length	*24ft. 3in.*
Height	*6ft. 8in.*
Wing area	*161.2 sq. ft.*

d heir Characteristics

INTERSTATE L-6



DIMENSIONS

Span	*35ft. 6in.*
Length	*23ft. 3in.*
Height	*7ft.*
Wing area	*173.8 sq. ft.*

A MILITARY development of a popular civil type of light aircraft much favoured by flying clubs and private owners before the war, the Interstate L-6 is (as its U.S.A.A.F. designation suggests with unusual clarity) the sixth liaison type to be used by them.

Two models of the Interstate high-wing monoplane are in production, the normal civil version, which is used by schools operating under the Civil Pilot Training Plan and is known as the C.P.T. Cadet, and the Army's L-6, illustrated here. The only material difference between them is that the L-6 has the transparent section of the two-seater cabin carried very much farther back to increase the range of vision of the observer, who sits with his back to the pilot and is provided with a map table over his legs. But since maximum visibility is desirable in any aircraft, it is difficult to see why this large transparent section is not employed on all models.

Mixed wooden and metal construction is employed for the wings, which are externally braced by "V" struts after the accepted fashion of almost all light aircraft in this category. Fabric covering is employed except for a metal leading-edge, and semi-Frise type ailerons are fitted. The fuselage is a welded steel tube structure with fabric covering, and the tail unit has a metal framework with fabric covering and bracing wires.

The wings are of comparatively high aspect-ratio, with parallel edges and rounded tips (again characteristic of the breed); the tailplane is elliptical and the single fin and rudder large but shapely.

A 65 h.p. "flat four" Franklin engine gives a top speed of 107 m.p.h. with a cruising speed of 100 m.p.h. Service ceiling is 15,000ft. and cruising range 375 miles. No flaps are fitted, but with a wing-loading of only 7.2 lb. sq./ft. the landing speed is as low as 38 m.p.h.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Reduction

THE Vichy Government "Official Journal" published a law reducing the establishment strength of Air Force officers and N.C.O.s to "relieve congestion." Similar measures are to be applied to the naval establishment.

Labour Recruiting

ACCORDING to a German report, several thousand foreign workers have been made available for the German war industry after retraining in centres organised by the Proficiency Organisation of the German Labour Front.

Gas Warfare?

HINTING perhaps at a possibility of the use of gas by the Germans, a summary of a lecture given before the German Chemists' Association by Dr. Ramstedter, of the Rostock University, concluded with the following words: "For obvious reasons details of chemical achievements and inventions cannot be discussed at present, but their effect will certainly be remarkable."

A New Heinkel

DETAILS are now available of the Heinkel He 177 bomber, about which information has hitherto been very confused.

The He 177, which has been under development since 1939, has gone through so many modifications that it is likely that previous reports were in the main correct and varied with the different experimental versions of the aircraft.

What is likely to be the final version of the He 177 is a cantilever all-metal monoplane with wings of a parallel centre section and tapering outer panels. Fowler flaps are fitted and provision is made for the attachment of diving brakes outboard of the engine nacelles.

Wing span is 103.5ft.

The two striking features of the He 177 are the power plant and the undercarriage. The latter consists of two main landing wheels on each side which diverge during retraction into the wing; when the undercarriage is raised, two wheels are inboard of the engine nacelles and two are outboard.

Original types of the He 177 were powered with DB606 engines, each composed of two DB601 mounted side by side. The present version is equipped with two DB610, which consist of two DB605 coupled together. It will be remembered that the DB605 is a 12-cylinder inverted Vee liquid-cooled engine of 1,350 h.p. at 18,500ft. The top speed of the He 177 is about 300 m.p.h.

Each double engine unit drives a four-blade airscrew, and frontal radiators are mounted forward of the wing.

The stressed-skin fuselage is of rectangular section with rounded corners and the tail unit embodies a single fin and rudder of an angular shape.

The main bomb load of the He 177 is carried internally. The armament, which consists of 13 mm. guns, is usually fitted in the nose, dorsal, ventral and tail positions.

As far as is known the production of the new bomber is only on a small scale.

Jap Recruiting

JAPANESE authorities in Malaya are now enrolling recruits for a six months' training course at a naval aircraft school.

Those eligible are youths between 15 and 22 who are physically fit and have some technical education. During the period of training trainees will be provided with free board and lodging and a monthly allowance.

The Jap Way

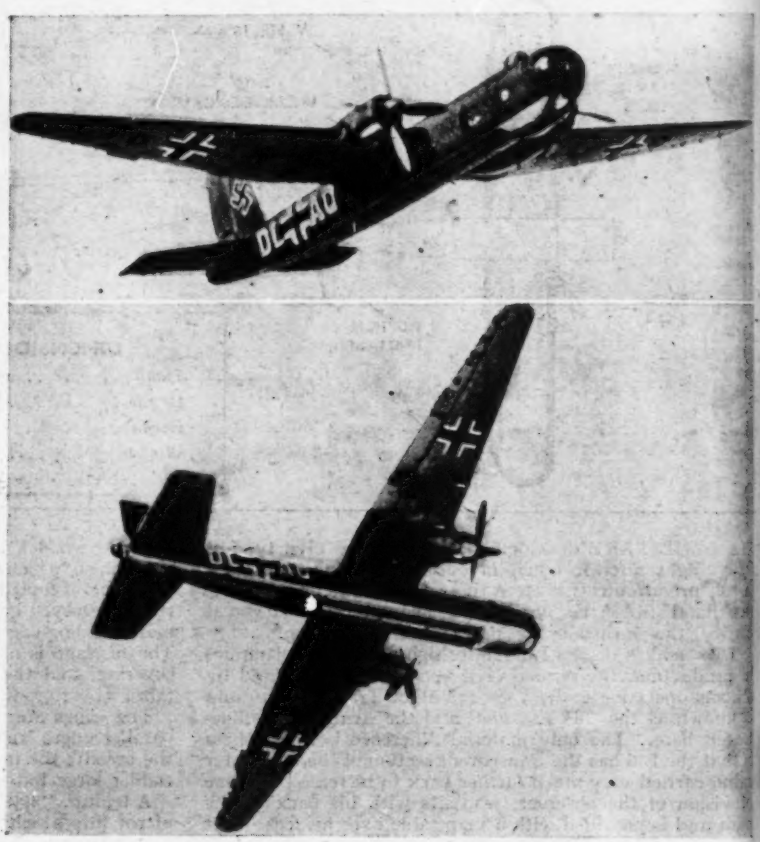
CAPTAIN FUJIMARA, Naval Air Attaché at the Japanese Embassy in Berlin, described in an interview the method of reporting and recording successes employed in the Japanese Air Force. "The report of every Japanese airman—he said—goes first to the Tenno, and no Japanese would deceive the Emperor," apparently a necessary precaution not too favourably reflecting the general standard of honesty.

But honesty or no honesty, Fujimara asserts that in their morale the Japanese pilots are superior to American and, coupled with their equally superior training, this will more than make up for the difference in aircraft production, in which the U.S. have an overwhelming advantage.

This training and morale are said to be responsible for the very small Japanese losses, which the optimistic Fujimara places in a ratio of one to four to those of the Allies.

From Occupied Poland

BY order of the Director of the Reich Gliding School at Wasserkuppe, several gliding experts were permanently stationed in Occupied Poland to encourage gliding in all branches of the N.S.F.K. During the last few months courses were held for aircraft model construction instructors and workshop organisers; a special course for gliding instructors was recently inaugurated by the *Oberfuehrer* of the N.S.F.K. Wolf at an airfield in the foothills of the Beskidian mountains.



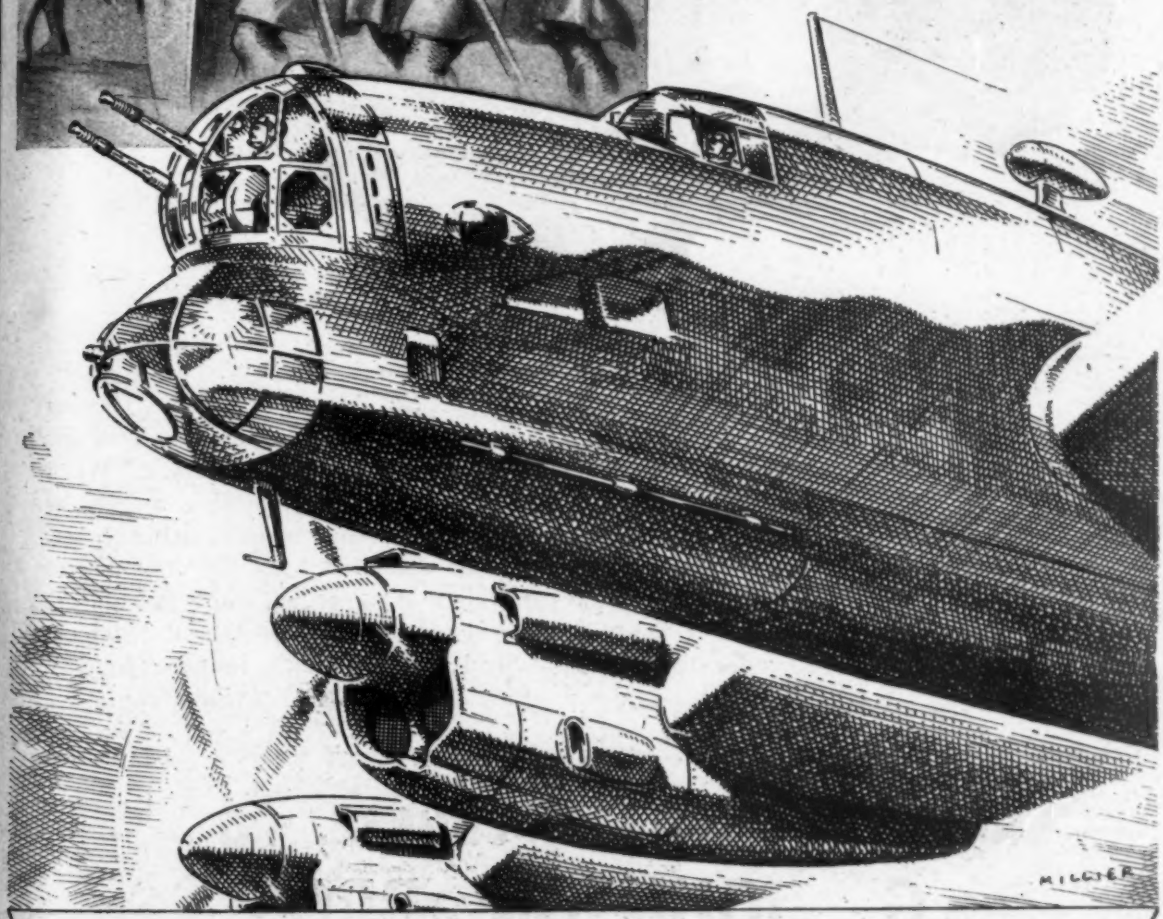
HEINKEL'S LATEST: The He 177 bomber, powered with DB610 engines, has a maximum speed of about 300 m.p.h.

WEAPONS OLD AND NEW

THE cross-bow, or arbalist, affords one of the earliest examples of the application of mechanical aid to weapons of war.

The propelling springs were made of steel or horn and the arrow was released by a trigger, but the time needed for re-loading was so considerable that the cross-bow never became very popular in this country.

In the gun-turrets of modern aircraft power and accuracy are no longer obtained at the expense of speed in operation, but all these qualities are combined to give a devastating fire power that has sealed the fate of many an enemy plane.



BOULTON PAUL

GUN TURRETS

BPA

OUR genial friend, Uncle Tom . . . of Cabin Heating fame . . . is certainly a "star" turn when doing his hot number in these remarkably cold surroundings. When asked why our old friend was shown smoking a pipe as he sped nonchalantly through numberless nebulæ and countless comets, our artist said it was merely a symbol of comfort. Actually, the kind of pipes he *really* favours are made of light alloy (insulated with Bell's Asbestos), which, under the careful control of the little man from Johnson Bros., disseminate grateful warmth to an equally grateful cre···

Cabin Heating, of course, by - -

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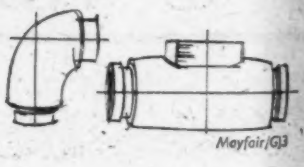
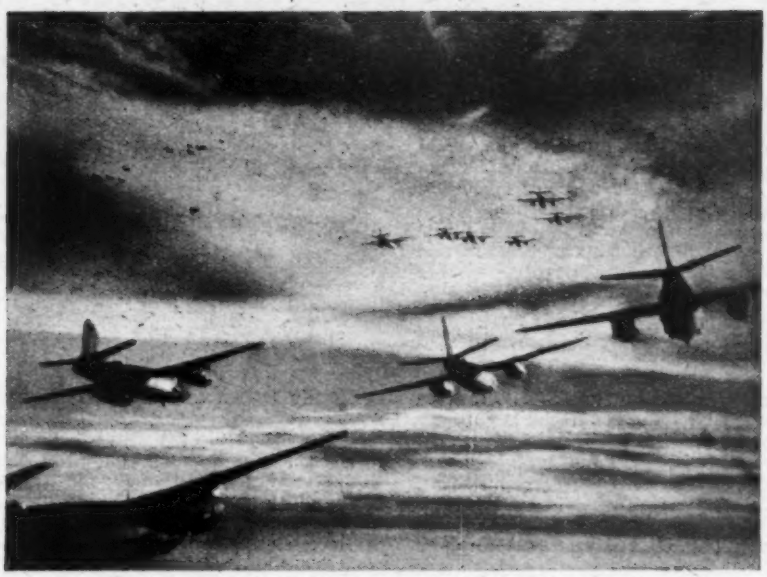


Mayfair/G3

The Air War in 1943



Marauders leaving for a dawn attack. Attacks by medium bombers on enemy installations in occupied Europe have been carried out almost daily.

Winning the Battle of the Atlantic : Development of Army-Air Co-operation : The Bomber Offensive Reaches Full Stature : From Defence to Offence in the Pacific

By MAJOR F. A. de V. ROBERTSON, V.D.

NOT many people in the United Kingdom seemed to realise how gloomy was the outlook at the commencement of the year 1943, A.D. Everybody was rejoicing over the victories in Africa, and few gave anxious thought to the serious position in the Atlantic. The British are the greatest sea-faring race in the world, but few individual Britons know much about the Navy or about naval affairs. They have a blind trust that the Admiralty will put everything right, and so far that trust has been justified. In this case Coastal Command of the Royal Air Force had a great deal to do with putting things right, but it likewise is almost a *terra incognita* to the man in the British street. Probably few Britons noted the remark of Air Chief Marshal Sir Frederick Bowhill, a former A.O.C.-in-C., Coastal Command: "Ships are going to win this war."

Yet in January, 1943, the danger signals were flying. Lord Hankey, a very good judge, wrote that our shipping losses in the Atlantic were more than double their replacement, and added that our striking power in the coming year would exceed our capacity to transport it. In the United States the calculation was publicly announced that the Germans had at the time 100 U-boats at sea, which implied a total fleet of not less than 400 of these craft. As late in the year as March Admiral Sir Percy Noble, who was on duty in America, expressed his apprehensions about what would happen in the summer when the German submarines would be able to get really busy. As the whole strategy of the United Nations has always depended on being able to get convoys across the Atlantic, the situation was indeed serious.

The new convoy escort carriers, known as "baby flat tops," shared with very long-range aircraft the closing of the air-coverless gap in mid-Atlantic.

Slaughter of U-boats

In spite of all this, the year has gone well for us at sea. In the three months, May, June and July, no fewer than 90 U-boats were sunk for certain. In November the Prime Minister was able to announce that we had broken the back of the U-boat menace, and Field Marshal Smuts also stated definitely that "the U-boat was beaten." It has been a victory almost as miraculous as the Battle of Britain, and it was a miracle accomplished by brains and organisation.

In the first quarter of the year Bomber Com-

THE AIR WAR IN 1943

mand devoted a great deal of energy to bombing the U-boat bases at Lorient and St. Nazaire, as well as the shipyards at Kiel and Hamburg where the boats were built. Factories which made engines and essential parts were also heavily bombed. These raids must have reduced the number of submarines which the Germans might have been able to put to sea, but they evidently did not strike anything like a fatal blow at the German effort. Our main enemies have a genius for getting things done in the face of difficulties, and the way in which they have dispersed the various branches of their war production makes it well-nigh impossible to knock out any one branch with a few swift and heavy blows. In June the Prime Minister declared that U-boats were best destroyed round the convoys, and so Bomber Command's series of attacks on the bases were allowed to fade away, very much to the gratification of that Command, which was left free to undertake its great attacks on the Ruhr and Berlin.

The problem, of course, concerned the "gap." In previous years Coastal Command had driven the U-boats away from the western approaches to the United Kingdom, and for a time they found their happiest hunting ground off the coasts of the American continent. Steadily, however, the abilities of the U.S. Army bombers and naval vessels took their measure, and the Royal Canadian Air Force and Navy also struck mighty blows. Squadrons from Iceland helped, until the only real danger spot for the convoys was the stretch of the ocean which lay between the operational

Continuing its good work as a fighter, particularly in the Mediterranean area, the Bristol Beaufighter has also appeared as a fighter-bomber and torpedo dropper.

limits of the bombers from the British Isles and those from America and Iceland. That gap had to be dealt with.

V.L.R. Bombers

Nobody ought to minimise the efforts of the Royal Navy and the U.S. Navy. They improved their methods and produced new devices, and, as is the naval way, they said little or nothing about them. But the very use of the word "gap" proved that the matter depended mainly on increased air protection. During the past year that was provided in two ways, by the use of escort carriers, which are merchantmen covered over by a flight deck, and by what Mr. Churchill called "the startling intervention" of the Very Long Range bombers of Coastal Command. Subsidiary aids had been the arming of the bombers with depth charges instead of bombs, and the recent introduction of the Leigh light, by which aircraft can see submarines on the surface by night when they come up to charge their batteries. In the autumn Portugal permitted the Allies to use the Azores as an anti-U-boat base, and this greatly facilitated the protection of the convoys in the middle of the Atlantic.

The U-boats were armed with more powerful A.A. guns than formerly, and the packs adopted the tactics of remaining on the surface (where they could use their speed) and engaging the aircraft with concentrated fire from the whole pack. Those tactics did not pay, though some aircraft were shot down. The result of the year's struggle in the Atlantic is that the United Nations have passed from a condition which threatened to become desperate to one of almost complete mastery, at least for the time being. In July the German Admiral Lützow admitted in a broadcast "the enemy at present has the upper hand."

British airborne troops were used fairly extensively for the invasion of Sicily. Both Airspeed Horsa and Waco CG4A Hadrian gliders were used.

Throughout the year the renowned Spitfire in its various marks and markings continued to give good service on every front. Being refuelled here is one in Italy with a Rolls-Royce Merlin 61 engine and pointed wing tips.

Conquest of the Mediterranean

In Africa the year opened with General Eisenhower's British and American force established in North West Africa, while General Montgomery and the redoubtable Eighth Army were driving the fleeing columns of Rommel out of Tripolitania into Tunisia. From the air point of view the most notable feature of the African campaigns was the development (or perhaps it would be more correct to say the discovery) of the method by which an Army and an Air Force can be welded into one overwhelming fight-

ing machine. After his first visit to the Middle East the Prime Minister told the House of Commons that he had laid it down that the Army Commanders should tell the Air Commanders what was required of the air arm, and that the latter should exert all their energies to obeying those directions. The result was eminently satisfactory, and it has had far-reaching results.

As the Eighth Army and the Desert Air Force entered Tunisia they were merged in General Eisenhower's command. One Air Command over the whole Mediterranean was established under Air Chief Marshal Sir Arthur Tedder. It was also under the obligation to help the operations of General Sir Maitland Wilson in the Middle East, who retained an air contingent under Air Chief Marshal Sir Sholto Douglas. The "unity of the air" was thus maintained, for the whole power of the Mediterranean Command was available to strike in either the east or the west, as required. In the west the Anglo-American Air Force, still known as the N.W. Africa Air Force, was divided into three Forces, Strategical, Tactical and Coastal, but all devoted to furthering the plans of General Eisenhower (as was also the Anglo-American naval force under Admiral Sir Andrew Cunningham) in his conquest of Tunisia, Sicily, Sardinia, Corsica and Italy. In Great Britain the American General Eaker, commanding the U.S. Army 8th Air Force, remarked that the most interesting and important lesson of the African campaign was the evolution of the Tactical Air Force. At once he decided to divide his Command into Strategical (or heavy bombing) and Tactical Forces, and the Air Ministry simultaneously made a similar reorganisation. Army Co-operation Command was abolished and its units were merged in a Tactical Air Force which operates under the orders of Fighter Command. Much will be heard of these Tactical Air Forces when the Continent is invaded from the West.

On May 12th a last raid on Axis forces in North Africa closed the Tunisian campaign The raid was carried out by Baltimores.

Ringing the Changes

In the conquest of Tunisia General Montgomery played a clever game by alternating his bombardments between artillery and the air arm. When General Freyberg, V.C., worked round the right flank of the Mareth line at the battle of El Hamma, he was aided (in the words of the Prime Minister) "to an extraordinary degree by novel forms of intense air attack." It appeared that guns could not be got up in sufficient numbers, and aircraft of many classes supplied the deficiency. But in the next assault, at Akarit, General Montgomery rang the changes by attacking on a moonless night, when tactical aircraft could not work, under the cover of a heavy artillery barrage. Military success seems to depend now a good deal on estimating the respective powers of bombs and shells in given circumstances, sometimes using the two together, at other times alternating them and possibly surprising the enemy by so doing.

The Fight for Airfields

In the meantime the Allies in northern Tunisia were handicapped by not having enough airfields, especially forward grounds from which fighters could operate. That part of the campaign was very largely a matter of the possession of air bases. As the Allies pressed on the character of the air side of the war began to change. It became of prime importance to hamstring the enemy by pounding his airfields, and so giving freedom to our own bombers and fighters. At the same time the Germans began to withdraw some of their men from Tunisia, partly in large troop-carrying aircraft, and Air Marshal Coningham's fighters slaughtered the Ju 52s in great numbers. At the end the Germans decided to cut their losses. They could not save General von Arnim and his Army, which had to surrender, but they withdrew as much of the *Luftwaffe* as could be extricated. From that moment up to the end of the year the Allies have held undoubted and practically undisputed air supremacy in Africa, in Sicily and in Italy. They have made very good use of it.

We should note two new types which made their appearance during the later stages of the African campaign, namely, the Spitfire bomber and the Hurricane "tank-buster." The latter was regarded as a useful auxiliary, but not as in any way a substitute for anti-tank guns.

By this time combined operations by the three Services, and likewise

Although the De Havilland Mosquito has appeared in many forms, both civil and military, its outstanding work for the year has been performed during the night hours as pathfinder, bomber and intruder.

THE AIR WAR IN 1943

by British and American forces working as one, had been brought to a high degree of perfection. This was exemplified by the landings in Sicily, in Calabria and at Salerno. In Sicily British airborne contingents were landed, both by parachute and by glider. It was found afterwards that certain lessons were to be learnt about the employment of these very specialised battalions, which were being tried out then for the first time in major operations. None the less, General Montgomery said that their work had saved his men a whole week.

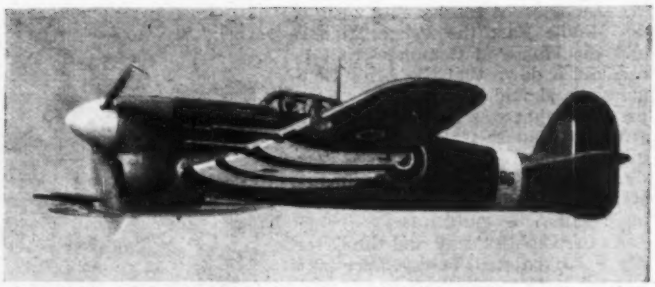
The reduction of the island of Pantellaria gave rise to some discussion. It was first bombarded by the Navy, and then very heavily pounded by every sort of bomber. The garrison, consisting mostly of Italian troops of not a very high class, surrendered, saying that they could not stand the air bombardment, though the few Germans who were on the island thought that a better resistance could have been made. The most sober authorities, including General Spaatz, who commanded the N.W. African Air Force, and General Marshall, Chief of Staff of the U.S. Army, came to the conclusion that Pantellaria did not prove that air bombing could reduce any and every place.

Italy Knocked Out

The first steps in the invasion of Italy were largely governed by the possession of airfields. Salerno was selected for the second landing because it was the only suitable beach which could be in any way covered by Allied fighters based in Sicily. Those fighters could only be sure of spending 20 minutes over the beach, but by a masterly system of reliefs, the R.A.F. managed to keep never less than four squadrons of fighters over the battlefield by day. Naval aircraft from large and small carriers also did most indefatigable work in the first four days of the battle, though, as a matter of fact, *Luftwaffe* fighters made very little attempt to interfere. Their bombers mainly disregarded the troops and landing barges, and tried to damage the British warships.

In September Foggia, with its circle of airfields, was captured, and that altered the position. President Roosevelt described its capture as "one of the most important Allied successes yet from the strategic point of view."

Before September had run half its course, Mussolini had resigned and Italy had accepted unconditional surrender. In October she declared war on Germany. Such a *volte face* in the middle of a great war must be without precedent. The chief excuse made for the surrender was that the country could not stand any more of the relentless hammering which she had been receiving from Allied bombers. That had certainly been severe, and the industrial cities of Milan and Turin had suffered in a special degree. The workers in them were clamouring for peace at any price. Still, other reasons were obviously at work; the bombing was not the cause of Italy's declaration of war on her old Ally. The surrender of the Italian fleet to the Allies was an event of first-rate importance. Except for German aircraft all the Mediterranean outside the Aegean Sea became a preserve for the British Navy and its American and Greek helpers.



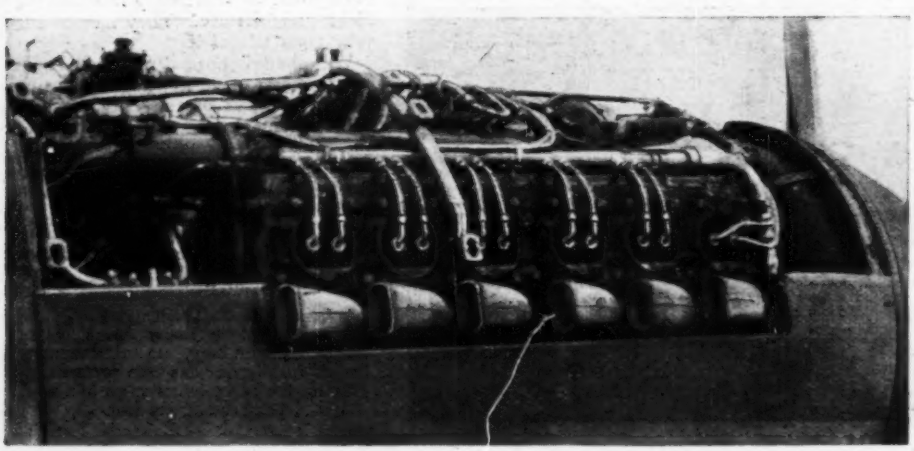
One of the year's "releases" was the Hawker Typhoon fighter and fighter-bomber. It was the first R.A.F. single-seater to go into production with over 2,000 h.p.

The one fly in the ointment was the Aegean, especially the Dodecanese Islands. The Germans promptly seized Rhodes. That gave them air superiority over the whole group. The Middle East tried to counter this by sending some Spitfires to Cos, and landing troops on that island as well as on Leros and Samos. The Germans drove us out of all three, and we lost the garrison (if so it could be called) of Leros. It was a bad business, and the reason can only have been that we did not give due weight to the part which the air arm must play in operations of that nature. To overlook the air arm must almost invariably spell failure.

The Great Bombing Offensive

While the past year has seen remarkable developments in the use of aircraft to help the Navy in the Atlantic and the Army in the Mediterranean, it has also witnessed the staging of a major bombing offensive by the R.A.F. and the U.S. Army 8th Air Force. These operations were independent of both the other Services, and were not aimed at winning any particular battle or even any particular campaign, but were intended to weaken Germany's power to carry on the war. They were aimed at the enemy's supply of weapons (in contrast to the Battle of the Somme, fought in 1916 to destroy a high proportion of Germany's fighting manpower), and were admittedly a long-term policy. It was officially denied that the object was to break German *morale*, though if such a break were to take place and shorten the war, so much the better. That this offensive detained something like two million Germans on anti-aircraft and civil defence was a secondary but extremely useful result.

When Britain was enduring the "Blitz" in 1940 hurried measures had to be taken to disperse her war industries, but Germany had been preparing for war for several years before 1939, and had dis-



The 24-cylinder, sleeve-valved Napier Sabre engine which is the power plant of the Hawker Typhoon. It has a horizontal H layout.

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persed her industries very cleverly. She is a large country, and has plenty of cities in which to set up war factories, but a great deal, if not most, of her dispositions was known to the Ministry of Economic Warfare in England. Nevertheless, a very heavy task confronted Bomber Command when it undertook this attack on Germany's supply of weapons. It was also known that before venturing on war the Germans had built up a huge strategic reserve of weapons, and this had to be exhausted before the results of Bomber Command's work could become apparent on the battlefield.

There was one simplification in the task which confronted Air Chief Marshal Sir Arthur Harris and his staff. Germany could not move the Ruhr and its coalfield, though she might increase to the best of her ability the use of the Silesian coalfield. Essen remained the great centre of her war industry, helped out by a ring of neighbouring towns.

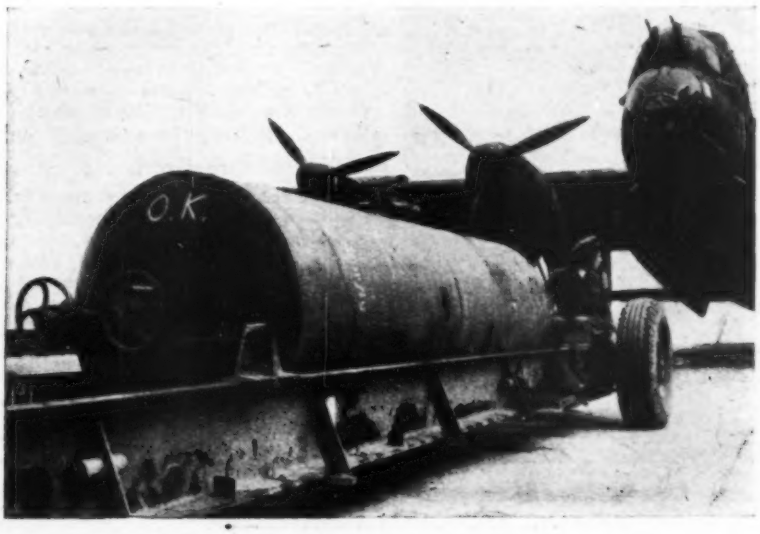
The Battle of the Ruhr

Bomber Command had long contemplated a heavy and regular campaign against German war industries, but various causes had prevented the putting of the plans into action on an adequate scale before 1943. At first there were not enough bombers, and those bombers were not large enough for the purpose. Then there were constant calls to help the other Services, such as the need to keep up attacks on the German warships in Brest harbour. By 1943, however, Bomber Command found its hands reasonably clear, and the production of Lancasters, Halifaxes and Stirlings had at length become sufficient for the Command to engage in heavy battles with strongly defended cities in which comparatively heavy losses of machines would have to be endured.

Both the Avro Lancaster (top) and the Handley Page Halifax have undergone modification. The Lancaster II has Bristol Hercules engines, and the Halifax II has had the front turret removed.

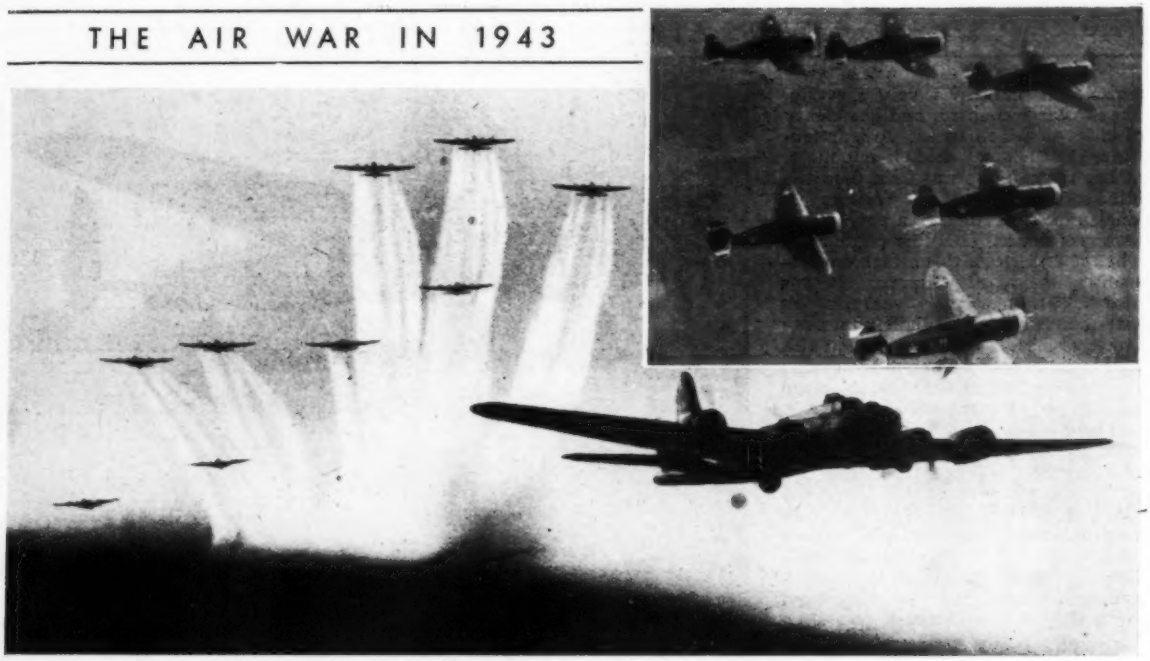
At the same time the U.S. 8th Air Force was building up its strength in Great Britain, and between March and June it more than doubled its strength. The process continued throughout the year, for General Arnold, who commands the U.S. Army Air Forces, gave first priority to increasing the bombing strength of General Eaker's 8th Air Force. The Americans always bombed by day; the R.A.F. almost invariably by night, though it occasionally sprung a surprise with a low-flying day raid.

When Brest no longer made calls on Bomber Command, and Coastal Command found itself in a position to send out long-range heavy bombers and other necessary aircraft, Air Chief Marshal Harris devoted his attention to Hamburg. By the end of November, 74 per cent. of the industrial area of that city had been devastated. Then he turned his full attention



Bomber Command have dropped fantastic bomb tonnages on German towns in saturation raids of short duration. Bombs varied from 2 lb. incendiaries to the 8,000 lb. type shown in this photograph.

THE AIR WAR IN 1943



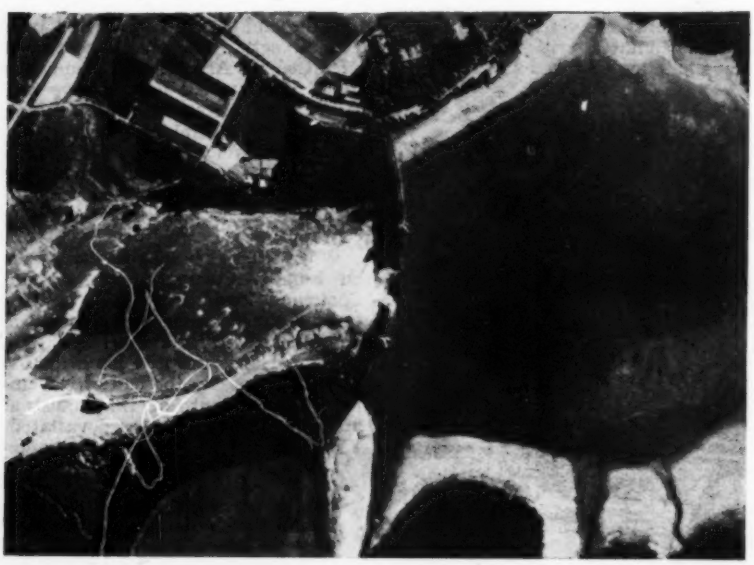
Day attacks by Fortresses of the 8th U.S.A.A.F. complemented the R.A.F. night attack. Severe losses, however, made it essential for long-range fighters (Thunderbolts and Lightnings) to accompany them to their targets.

to the Ruhr. As a matter of fact, Cologne had been the first city to experience a raid by 1,000 British bombers in one night. During 1943 Essen came in for a series of tremendous raids, and by the end of November 40 per cent. of the industrial area had been laid in ruins. Other Ruhr cities suffered in a proportionate degree. Of late, raids have been catalogued by the weight of bombs dropped, not by the number of aircraft which took part, and that is a much better way of taking stock.

The tactics adopted by Bomber Command are described as "saturation of the defences." This means arranging for some hundreds of heavy bombers to arrive over the target almost simultaneously, and for all to drop their bombs in the shortest possible time. Of late several heavy attacks have been finished within half an hour. This has meant a tremendous lot of very careful staff work, and the operation has now been reduced to a fine art. The fires from the incendiaries have spread so quickly, and they have been so numerous, that the fire brigades have been unable to cope with them, and they have often been seen still burning two or three days after the attack.

Another novelty has been the formation of a special corps of Pathfinders, very experienced pilots and navigators, who fly ahead of the bombing force and drop flares which indicate the limits of the target to the heavy bombers. So successful have the Pathfinders become, that by now heavy clouds and even fog do not make it impossible for a target to be obliterated with considerable accuracy.

One very notable episode in the battle of the Ruhr was the destruction of three great dams which supplied power to many of the industries of Ruhr towns. The crews which were specially trained to bomb these dams lost rather heavily, and the leader of them, Wing Comdr. Gibson, was rewarded with the Victoria Cross.



The most important single raid of the war was the one carried out by Lancasters of Bomber Command on May 17th, when the Möhne Dam was breached.

The Battle of Berlin

After the battle of the Ruhr came the battle of Berlin, which may be regarded as still in progress at the close of the year. Raids on Berlin mean a long flight across defended territory, but the proportion of bombers lost to the number which set out has steadily diminished.

In recent months the Germans have relied less on *flak* for defence and more on fighters. They have developed a technique of dropping flares in lanes around the bombers. But the *Luftwaffe* is now actually feeling a shortage of fighters. They have left their bomber force on the Russian front extremely

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short of fighter protection, and our bomber crews have noticed how they have had to disregard the usual rule of single-engined fighters for protection by day and twin-engined ones for night work. Both by day and by night they have had to use whatever fighters they could raise, and this although they have tried to increase the output of fighters from their factories at the expense of bombers. It is no wonder that the Allied armies in Italy have seldom been worried by the activities of German fighters, and that the Russians have likewise benefited. In fact, the *Luftwaffe* has during the year been outnumbered as well as outfought.

While the heavy bombers have been doing their massive work of destruction, Fighter Command has maintained its daily raiding of all occupied territory within the range of its machines, and has struck heavy blows at German communications. The main work has been destroying or damaging railway engines, and the average has been something like 150 locomotives a month. Fighter and Coastal Commands have also harried the enemy's coastwise shipping throughout the year. Diversionary sweeps by Allied fighters have often forced the enemy to battle against his will, causing him losses which he can ill-afford.

In Burma hostilities developed into a "holding" war because of commitments on other fronts. This photograph of Blenheims making low-level attacks on Japanese shipping at Akyab is typical of the air operations carried out.

The German reply has been a number of raids by very small numbers of machines, mostly fighter-bombers, on the British coasts and Home Counties. They have been of no military significance.

The War with Japan

A very interesting experiment was tried out in Burma in the spring, when a force under Brigadier Wingate penetrated behind the Japanese lines in the jungle and was entirely maintained by supplies and ammunition dropped by aircraft. This expedient was later copied in the New Guinea fighting, when an Australian force was supplied by air in the same way. Throughout the year R.A.F. and American aircraft have held definite superiority over the Japanese in Burma.

The reconquest of Burma is obviously going to be a combined operation by the three Services. The appointment of Admiral Lord Louis Mountbatten is by itself enough to prove that.

He made a start by combining the units of the R.A.F. and the U.S. Army Air Forces which were in India into one Eastern Air Command, under Air Chief Marshal Sir Richard Peirse. He also copied the organisation of the N.W. Africa Air Forces by instituting Strategical and Tactical Forces.

In the South West Pacific the war gradually took on a different shape during the year. For long weary months General MacArthur had held the Japanese away from Australia by his bombers alone. It was an extraordinary sort of war, but the method of defence by bomber proved a success. In the course of 1943 the General felt himself strong enough to undertake a limited but very enterprising offensive. In all classes of arms his strength had been increased, and by the autumn he was able to invade a number of the islands which the Japanese had seized. These invasions were all combined operations modelled on the pattern of the Allied landings in Africa, Sicily and Italy. The U.S. Navy and American aircraft escorted the barges which took Australian and American troops ashore, and the operations were very successful. All three Services have distinguished themselves, but there is nothing invidious in remarking that the air is General MacArthur's primary arm. Papua has been reconquered and the invasion of New Guinea makes progress. The Solomons have been cleared of the enemy, and the early days of winter saw a tremendous air assault on the great Japanese base at Rabaul in New Britain. This was followed by a landing of American troops on the south of the island, and as we write the advance is going well. The Allies now hold the initiative in the Pacific.

The long-range, twin-engined Lockheed Lightning has done good work in European and Pacific areas. Its long-range qualities made it particularly useful during the landings at Salerno.

Assisted Take-off

The Rôle of Composite Aircraft in Comparison with Various Other Methods

GROUP CLASSIFICATION B2*

THE problem presented in facilitating the take-off of heavily laden high-speed aircraft is not simple of solution, and as such, except in the case of flying boats, is a severe limiting factor on the size of aircraft that can be operated.

In comparison with the mammoth machines prophesied for the future, contemporary heavy aircraft are shown to be relatively small, and yet some of these present-day aircraft require extensive take-off runs. A further requisite in the interest of safety is the provision of as large a surrounding area of obstruction-free country as possible, in order that an adequate reserve of speed may quickly be built up prior to climbing.

W. Hoff, in a paper read before the German Academy of Aeronautical Research, reviewed possible methods of facilitating take-off, beginning with design features inherent in the machine—high-lift flaps, variable-pitch airscrews, low-drag undercarriage, etc.

Such features by themselves will not suffice, and take-off runs of the order of 2,000 yards are not uncommon for the largest heavily loaded high-speed machines; this necessarily restricts the operation of such aircraft to specially constructed airfields.

Numerous proposals have been put forward to overcome the difficulty; inclined runways would be of great help, but their dependence on prevailing wind conditions scarcely justifies the expense. Catapult starts date from the time of the Wright Brothers, but the design becomes very cumbersome when applied to machines weighing more than about 25 tons. The catapult essentially constitutes a moving platform of relatively short travel and must therefore operate with considerable acceleration.

It has been proposed to attach the platform to a separate motorised vehicle which has sufficient engine power to accelerate to the necessary speed over a distance corresponding to the available take-off run. By employing a wide track and wheels of large diameter, sufficient stability can be assured even if the ground is not in first-class condition.

Auxiliary Power

This scheme appears to have been worked out in detail in Germany, but it is not known whether it has actually been tried. The aircraft could be mounted on the platform with its undercarriage already retracted, and this should prove beneficial in reducing initial climb drag.

Attention was given to other possible schemes such as tow rope starts, either with a winch on the ground or employing an aircraft tug. Considerable experience has been gained with these methods in the case of gliders, but it is doubtful whether they are practicably feasible for really large machines. Assisted take-off by means of auxiliary power plants such as rockets was also mentioned, but no specific details were given.

The author then returned to the consideration of moving-platform starts and suggested that the employment of a second aircraft for this purpose (viz., a composite aircraft) instead of a ground vehicle would present certain advantages, the chief being that the launching can take place at a safe altitude and close to the target.

[In this connection, it is not clear whether the large aircraft envisaged are intended for military or civil use. It is interesting if the Germans are contemplating ultra-large machines for military use, but if the subject is being treated purely on an academic basis, then the choice of the word "target," in preference to "destination," is both singularly unhappy and a further pointer to the natural trend of Teutonic thought.]

Two possible solutions present themselves, depending on whether the aircraft to be launched is fixed above or below the aircraft serving as a carrier. Both schemes were investigated theoretically in some detail, the aircraft to be launched having the following characteristics:—

Weight	32.88 tons
Wing area	1,001 sq. ft.
Horse-power	5,000
Wing loading	73.78 lb./sq. ft

Designed as a conventional monoplane, this machine would have a take off run of approximately 2,200 yards.

Performance-size Comparison

Various sizes of the carrier aircraft were considered, as will appear from the following table, in which schemes (1) and (2) refer to the launched aircraft being above the carrier, whilst (3) and (4) refer to the alternative position. A constant force of 3,690 lb. at separation of the two aircraft is assumed in each case, this force being occasioned by the difference in lift of the individual machines.

	Above		Below	
	(1)	(2)	(3)	(4)
Weight (tons)	21.2	10.6	32.88	16.44
Wing Area (sq. ft.)	2,002	2,002	2,507	2,507
Wing Loading (lb./sq. ft.)	24.22	12.11	29.45	14.72
Horse-power	5,000	1,250	7,500	1,250
Min. theoretical take-off (yards) of combination	500	620	535	600

It should be noted that under the assumed conditions of a constant separating force, there is no very marked difference in the length of take-off runs, despite the fact that the horse-power and weight of the carrier aircraft have been changed over wide limits.

The beneficial results from this method of launching are obvious, the original take-off distance of 2,000 yards having been reduced to 500-600 yards.

Of especial interest is the fact that the horse-power of the carrier aircraft can be cut down to a considerable extent without appreciably affecting the results obtained, providing that the wing loading of the carrier is sufficiently low. The logical conclusion arising from this is that the carrier should be built in the form of an auxiliary wing without any additional power plant. The launching in

**THIS is the third in the series of articles based on abstracts from the world's scientific and technical Press as compiled by R.T.P.3 Section of the M.A.P.*

The subjects dealt with in the series are divided into the following groups :—

A. Aerodynamics and Hydronamics.
B. Aircraft and Airscrews.
C. Engines and Accessories.
D. Materials and Methods.
E. Instruments and Devices.
F. Production.
G. Physiology and War Medicine.

Each article appearing will carry its classification group letter followed by a number indication that it is the 2nd, 4th, 7th, etc., in that group to be published.

The articles will not necessarily appear in the alphabetical order of their groups.

ASSISTED TAKE-OFF

these circumstances would correspond to shedding the auxiliary wing. [The Pemberton Billing-Chown "Slip-wing" scheme appears to find German approval.—ED.]

The scheme with the carrier below the aircraft to be launched has been tried out in practice by Mayo. In this case a permanent aircraft of more or less orthodox design, but suitably strengthened, can be employed. The attachment of the two machines has to be carried out by means of a crane.

In the counterpart alternative scheme (i.e., with the carrier aircraft above) the initial requirement is that the carrier be provided with a sufficiently high undercarriage so that it can "step over" the second aircraft to facilitate the attachment operation. A crane will not be required, but the design of the carrier aircraft will require most careful consideration.

This method of launching will, on the other hand, present the important advantage of operating with greater safety at a lower dynamic pressure, since the launched aircraft can dive immediately after separation and thus quickly gain speed.

During the discussion following the presentation of this paper, the value of composite aircraft as a means of providing assisted take-off was questioned, especially for weights in excess of the order of 30 tons, such as are considered by the author. A more profitable line of development was considered to be the design of power units capable of standing up with safety to a 50 per cent. overload during the take-off and subsequent climb (at least 30 minutes).

Under such conditions a take-off of the order of 1,300 yards should generally be possible for a 45-ton machine, and this could be cut down to well below 1,000 yards by the provision of efficient rockets.

It should not be forgotten that methods of take-off (directly assisted or not) to be worthy of consideration must envisage the possibility of having to be applied to the large aircraft of the future—100 tons is a commonly quoted figure—for which the composite method of launching appears scarcely to be feasible.

On the question of employing rockets as a means of assisting take-off, R. Healy, writing in *Aviation*, mentions that recent tests, made in the U.S.A. on commercial powder rockets, show that a rocket weighing 1.5 lb. (0.5 lb. explosive charge) can produce a thrust of approximately 15 lb. for 3 sec.

Opel in his 1929 tests is stated to have obtained a thrust of 53 lb. for a period of 25 sec., using a 10 lb. charge. Other experiments have claimed thrusts up to 600 lb. for 3 sec. with larger charges.*

Extrapolating from these results, Healy concludes that a 12.5 lb. charge of black powder should be capable of maintaining a thrust of 200 lb. over a period of 5 sec.

By firing ten of these charges simultaneously, followed after 5 sec. by combustion of a further ten charges, a thrust of 2,000 lb. for 10 sec. would be realised to accelerate the aircraft over its initial 50 m.p.h. It is stated that by making use of this method the Ju 88 is enabled to carry an excess load of 6,615 lb.

The author proposes that the individual weight of the black powder type rocket should be approximately 17.5 lb. (charge weight 12.5 lb.), and that as the charges become exhausted, the casings should be dropped from the aircraft. The average increase in weight during the assisted portion of the take-off will then be less than 200 lb.

The employment of smokeless powder or nitro-cellulose explosives should make possible a considerable further reduction in the weight of the installation.

By virtue of its inherent simplicity and the fact that the size of aircraft is not a limiting factor on the employment of the scheme, this method of assisting take-off appears worthy of most careful and detailed consideration.

* That these figures can be greatly increased by ejectors was shown in the article "Rocket Research," published in our December 2nd issue.—Ed.

HONOUR FOR SCOTS A.T.C. SQUADRON

IN Musselburgh Grammar School recently, No. 297 Squadron, A.T.C., under the command of Flt. Lt. G. A. Renwick, was presented with the Sawers Trophy for the A.T.C. unit in the South-Eastern Scotland area (Edinburgh excluded) obtaining the largest number of proficiency certificates during the year in relation to its strength.

Dr. J. R. C. Greenlee, headmaster of Loretto and vice-chairman of the local A.T.C. Committee, presided, and Bailie Thomas Sawers presented the trophy in the absence, through indisposition, of Group Captain the Duke of Hamilton. Bailie Sawers congratulated the officers, civilian instructors and cadets of 297 Squadron, which, he said, was the first squadron to be registered in S.E. Scotland, and one of the first in the country, though its number might not suggest that.

Referring to the Government announcement that it was intended to carry on the organisation after the war, he realised that before the war there was a Government scheme for assisting civil flying clubs, and he hoped there would be something of that nature after the war which would enable cadets to get real flying in addition to the gliding which they were to get.

AIRCRAFT AND SHIPBUILDING

CO-OPERATION between the aircraft and shipbuilding industries was urged by Capt. E. C. Goldsworthy in a paper, "Shipbuilding and Light Alloys," to the Institution of Engineers and Shipbuilders in Scotland, at Glasgow recently.

Many shipbuilders were to-day engaged on aircraft construction, he said, but was it not pertinent to enquire whether the aircraft constructor could not contribute to the construction of purely marine ships?

It had been stated that after the war the aircraft industry would be faced with a market estimated at only 10 per cent. of its capacity. Capt. Goldsworthy expressed the opinion that each industry could assist the other and that there was sufficient scope and need for development in both to keep them fully occupied on their peacetime basis.

A SWISS FIGHTER

THE C.36 is a multi-purpose aircraft widely employed in the Swiss Air Force. Used either for ground attack or as a single-seater fighter, the aircraft is of all-metal construction, powered with a Saurer-built Hispano engine of 1,200 h.p. driving an Escher-Wyss airscrew.

The C.36 has been designed by the K.T.A. (Military Technical Department) of the famous Federal Technical College at Zürich. After some modifications, particularly of wings, it has been turned over to quantity production with a reduced span, and improved cockpit cover similar to that of the Fairey Fulmar.

Incidentally, the forward section of the aircraft, including the wings, bears more than a passing resemblance to the Fulmar.

The armament of the C.36 comprises a high-speed Hispano cannon (a version improved by the Winterthur Company) and machine guns firing rearward in the ground attack machine.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

WHAT'S IN A NAME ?

Air Bombardments Are Not "Raids"

I WISH you and so many others would not use the word "raid" when we attack with aircraft. A raid suggests something quite different from aircraft delivering bombs on an enemy target.

If the target is shelled by guns it is called a bombardment.

The reason a bombardment is carried out by aircraft is because the target is out of range of guns. An aircraft is used as a long-range gun, and it is surely better to destroy the enemy's weapons before they come into use than to destroy them when they are used against us. By doing so, we save life.

Is the so-called "civilian" who makes the weapon more deserving of protection than the man who presses a trigger or a button?

We used to talk of "war zones" in which civilians could only enter or live with military permits. The Germans did away with them in this war. "F.R.Ae.S."

CONSTANT-SPEED AIRSCREWS

Rotol's Contribution in Battle of Britain

IN connection with the article "Pitch Panic" in *Flight* of December 9th, without in any way attempting to belittle the excellent performance of the De Havilland Company at the time of the Battle of Britain in converting in so short a time, and under such arduous conditions, their existing two-position variable-pitch airscrews in the Services to 20 deg. range constant-speed type, I feel that, in fairness to Rotol, Limited, it should be generally known that this company were first in the field with 35 deg. range constant-speed airscrews, we having delivered prior to the Battle of Britain a considerable number to the Royal Air Force.

Special reference is made to the 35 deg. pitch range feature, since the two extremes of pitch angle in a fighter must be such as to ensure full r.p.m. at take-off and yet have a sufficiently coarse angle at the other end to prevent over-revving in a dive. In general the 20 deg. range airscrew is not capable of dealing with both these requirements, and consequently one or the other requirements must suffer.

Rotol constant-speed 35 deg. range airscrews had been in operation in France in May, 1940, on Hurricane aircraft, and had been serviced by Rotol engineers sent out specially for this purpose.

In fact, it has been stated that the stock available of 35 deg. range Rotol constant-speed airscrews played a very considerable part on Hurricanes and Spitfires during the Battle of Britain.

Reference has been made to this very early use in "Arise to Conquer" by the late Wing Cdr. Ian Gleed, D.F.C., in which, on page 36, he refers to Rotol airscrew planes getting off first, and gives an explanation of the Rotol constant-speed airscrew. In "Fighter Pilot," on page 74, there is also reference to the Rotol airscrew being fitted to Hurricanes in France in May, 1940.

Rotol throughout have only delivered variable-pitch airscrews of the constant-speed variety, and, with the exception of the original Whitleys, which carried out the pamphlet-dropping expeditions into Germany, have all been of 35 deg. pitch range. The early Whitleys referred to had 20 deg. range constant-speed airscrews, but this type has now for a long time been obsolete.

L. G. FAIRHURST (chief engineer, Rotol, Limited).

THEORY OF FLIGHT

Getting Rid of Approximation

THE conclusion reached by Mr. Hick in the last paragraph of his letter published in *Flight* on November 18th seems to be open to criticism, since his final equation is based on the somewhat unnecessary assumption that the flight path is so nearly horizontal that the weight can be put equal to the lift. Since this assumption is not strictly true, the final equation becomes an approximation only, and it seems unsafe to draw conclusions as to the result of altering one variable when, for the sake of approximation, a dependent variable is omitted.

If θ is the inclination of the flight path of the horizontal $L = W \cos \theta$, and if this value is used the final equation becomes

$$d = h\frac{C_L}{C_D}\left(1 - \frac{V_w}{\cos\theta}\sqrt{\frac{SC\ \frac{1}{2}\rho)}{W\cos\theta}}\right)$$

the positive and negative signs applying to following and head winds respectively.

From this conclusion it will be seen that since $\tan\theta = C_D/C_L$ any variation of C_L is accompanied by a variation in the value of θ, and consequently the effect of varying C_L depends on the rate of change of $\cos^3\theta$ with respect to C_L.

Since it is to be presumed that the aircraft is gliding at its optimum angle, i.e. its attitude is that which gives a minimum value of C_D/C_L, it follows that the values of θ and C_L are fixed, and if this is the case it is obvious from the equation that it is advantageous to increase W when gliding against the wind and to decrease W when gliding with a following wind; while in still air W has no effect on the horizontal distance traversed.

J. D. BLYTH (Lt.-Col.).

Gliding Duration and Distance

FOR the benefit of "Bemused," and others who may tend to go wrong in a vital situation, a fuller explanation of the problem seems necessary than that given by me in your October 14th issue.

Fig. 1 shows the forces acting in a steady glide in still air.

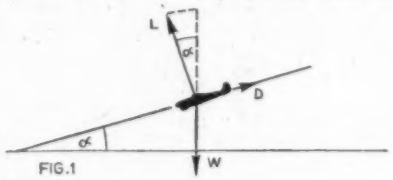


FIG. 1

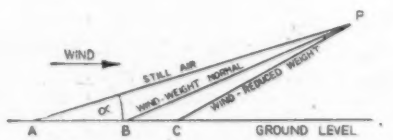


FIG. 2

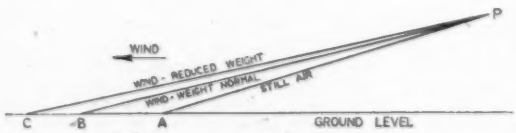


FIG. 3

This shows, from the triangle of forces, that the gliding angle is dependent upon the L/D, i.e., $\text{Tan}\,\alpha = D/L$, the flattest glide being obtained when L/D is a maximum.

Also $L = W\,\text{Cos}\,\alpha = C_L S \frac{1}{2}\rho V^2$.

Therefore $V = \dfrac{W\,\text{Cos}\,\alpha}{C_L S \frac{1}{2}\rho}$

Thus the smaller the weight (W) the less the speed.

Consider the aircraft at point P (Fig. 2). In still air its path will be PA. Now add a head wind, assumed to carry it a distance AB while travelling the distance PA relative to the air. The path is now PB. Reduce load and the airspeed is decreased; thus the aircraft will take longer to travel the distance PA relative to the air, with the result that the wind will now carry it further, from A to C, so that its path is now PC.

Fig. 3 shows the effect in a following wind under the same conditions.

With reference to Scott-White's letter, by all means jettison in a head wind to gain height, but at the end of the glide, near the ground, where the loss of speed will have little effect. A skilled pilot will obtain full advantage of this by putting the nose up to stop the reduction of lift due to the change of motion upwards tending to reduce the angle of attack.

J. D. HADDON.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

BOMBS FOR BREMEN : A formation of Fortresses seen from another formation on a lower level.

Promotions

GENERAL DUTIES BRANCH.

Air Commodores (temp.) are granted the rank of Air Commodore (war subs.).

J. W. JONES, C.B., November 10th, 1943.

T. A. LANGFORD-SAINSBURY, O.B.E., D.F.C., A.F.C., November 16th, 1943.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy.

Distinguished Service Order

F/O. R. L. W. CHEEK, R.A.F.V.R., No. 40 Sqn.—One night in October, 1943, this officer executed a most determined and highly successful attack on an enemy airfield near Rome. F/O. Cheek made several runs over the target, releasing his bombs to good effect. Several of them burst in front of the hangars and a large aircraft was set on fire. He afterwards came down to almost ground level to sweep the objective with a hail of bullets. As a result, six aircraft were set on fire, three of which exploded. The following night F/O. Cheek attacked another airfield in the same area. In spite of opposition from the ground defences, he executed resolute bombing attacks and afterwards machine-gunned the airfield from a low level. On other occasions, F/O. Cheek has attacked various targets with equal vigour.

Lt.-Col. J. A. WILLIAMS, D.F.C., S.A.A.F., No. 24 (S.A.A.F.) Sqn.—Since the award of the D.F.C. this officer has completed a large number of operational sorties and on 40 occasions has led the squadron of which he is commanding officer on daylight operations, pressing home his attacks with great courage and determination at all times. While under his leadership no aircraft has been lost.

Act. Group Capt. J. DARWEN, D.F.C., R.A.F. (since deceased).—This officer has led his wing continuously since before the invasion of Sicily. Based on Malta, this wing performed excellent work bombing and machine-gunning troops and motor transport concentrations in Sicily. Later, while in Sicily, it continued this work under exceedingly difficult circumstances in mountainous country. In the Italian campaign, the wing operated with good effect against the Germans. Throughout these operations the personnel of this wing derived much of their inspiration from the very gallant and courageous leadership of Group Capt. Darwen who has invariably displayed the utmost enthusiasm and bravery in the face of the enemy.

Lt.-Col. B. R. MCKENZIE, S.A.A.F., No. 458 (R.A.A.F.) Sqn.—This officer has an outstanding operational record, and in addition to his more recent work with No. 458 Sqn., he has completed many operations from Egypt, Libya and Malta with excellent results. In July, 1943, he delivered a telling attack on an enemy merchant vessel which disappeared within four minutes, and on another occasion he damaged an enemy ship off the south coast of France, making three runs over the target in the face of an enemy fighter attack. His squadron, while under his command, has played an important part in operations against the enemy.

Act. Group Capt. W. G. MOSEBY, D.F.C., R.A.F.O., No. 153 Sqn.—Group Capt. Moseby has held his present command since March, 1942. While in the North African theatre of war his squadron has operated continuously with considerable success on night fighter protection of shipping against low level attack and has always shown a high degree of efficiency and excellent morale. During a period of conversion from one type or aircraft to another, this squadron was maintained at a high level of operational readiness, largely due to the efficiency and initiative displayed by this officer.

Act. Sqn. Ldr. T. M. CHANNON, R.A.F.V.R., No. 69 Sqn.—This officer has commanded a squadron based on Malta for a considerable time. Recently while engaged on a reconnaissance sortie his aircraft was intercepted by two Me 109s. The first of these was hit and broke away in flames. The second made eight attacks before finally abandoning the combat in a damaged condition. On another occasion Sqn. Ldr. Channon's aircraft was attacked by two enemy fighters on returning from a sea reconnaissance. One of the enemy was destroyed by the rear gunner, but his own aircraft had the rudder and elevator controls shot away. Despite this, Sqn. Ldr. Channon, displaying exceptional skill, made a successful landing.

F/O. G. Wilson who received the D.S.O., D.F.C. and D.F.M. at a recent investiture.

Act. Sqn. Ldr. G. R. A. FORSYTH, R.A.F., No. 216 Sqn.—Sqn. Ldr. Forsyth and Flt. Sgt. Whitelaw were pilot and navigator respectively of the leading aircraft of a formation detailed to drop parachute troops on the island of Cos in September, 1943. The operation demanded a high degree of skill, precise timing being essential to success. Nevertheless, Sqn. Ldr. Forsyth, brilliantly supported by Flt. Sgt. Whitelaw, whose navigation over a difficult route was faultless, unerringly led his formation to the target where, with amazing precision, the troops were dropped in the selected zones.

Act. Wing Cdr. R. C. ALABASTER, D.F.C., R.A.F.V.R., No. 97 Sqn.—Since being awarded a bar to the D.F.C., this officer has participated in many sorties, including two attacks on Berlin. His fearlessness and skill have been an important factor in the many successes obtained. He is a most efficient flight commander and his example both in the air and on the ground has proved an inspiration to all.

Act. Wing Cdr. M. M. FLEMING, D.F.C., R.A.F.O., No. 419 (R.C.A.F.) Sqn.—Wing Cdr. Fleming has displayed outstanding skill, courage and devotion to duty. He has undertaken a large number of sorties during which he has attacked many important targets with success. Wing Cdr. Fleming is an ideal leader, whose example has contributed materially to the operational efficiency of the squadron he commands.

Act. Sqn. Ldr. H. J. DAVIES, D.F.C., R.A.F.V.R., No. 7 Sqn.—This officer has displayed high powers of leadership, great courage and skill, qualities which have enabled him to achieve much success during his tour of operations. In the course of his activities, Sqn. Ldr. Davies has attacked many well-defended targets, including centres in the Ruhr, Berlin and targets in Northern Italy.

Act. Sqn. Ldr. J. H. DUNK, D.F.C., R.A.F.V.R., No. 83 Sqn.—Since being awarded the D.F.C., Sqn. Ldr. Dunk has completed many sorties, involving attacks on many centres important to the enemy's war effort. Throughout, his work has been of a high order, and the successes obtained are an excellent tribute to his great efficiency.

Act. Group Capt. W. E. OULTON, D.F.C., R.A.F., No. 88 Sqn.—This officer has commanded his squadron since April, 1943, and since the award of the D.F.C. has taken part in a number of sorties. In the course of these missions he has made attacks on enemy submarines, sinking two. This officer has invariably displayed alertness and gallantry in his operational duties.

Wing Cdr. J. C. HALLEY, R.A.F.O., No. 502 Sqn.—This officer has completed two tours of operational duty, and has assumed command of his squadron. In addition to his heavy responsibilities on the ground, Wing Cdr. Halley has set a fine example by his work in the air.

Act. Wing Cdr. R. M. MACKENZIE, D.F.C., A.F.C., R.A.F., No. 201 Sqn.—In addition to being

SERVICE AVIATION

an excellent operational leader, Wing Cdr. MacKenzie has administered his squadron in an exemplary manner. He has led numerous strikes and has performed many meritorious flying feats, including sharing in the destruction of a Ju. 88 and flying his aircraft from the Ægean Sea to Cyprus on one engine. In July, 1943, in the face of intense anti-aircraft fire from the shore and ships in the harbour, this officer shared in the destruction of a large armed enemy merchant ship. Wing Cdr. MacKenzie's personal courage and devotion to duty have always been of the highest order, and it is due to his inspiration that the squadron has contributed so successfully towards upsetting the flow of German supplies to the Dodecanese Islands.

Act. Wing Cdr. H. N. G. WHEELER, D.F.C., R.A.F., No. 236 Sqn.—Wing Cdr. Wheeler has taken part in many operational sorties. Recently he has led seven successful Wing strikes. An outstanding leader, his cool courage, infectious confidence and untiring efforts have contributed largely to the high standard of efficiency and morale attained by his squadron.

Act. Sqn. Ldr. E. G. HUGHES, D.F.C., R.A.F.V.R., No. 540 Sqn.—Since his appointment as flight commander in January, 1943, this officer has displayed great energy, initiative and determination. During his operational flights, many of which have been accomplished in the face of enemy opposition, he has shown outstanding ability and foresight. His sorties have included flights over Berlin and many surveys of the Cherbourg Peninsula, Norway, Denmark and the Baltic ports.

Act. Wing Cdr. G. F. GRANT, D.F.C., R.A.F., No. 156 Sqn.—Since being awarded the D.F.C. this officer has undertaken many sorties, covering a wide range of targets. His unswerving devotion to duty, fortitude and tenacity were amply demonstrated on one occasion when he attacked Bochum in the face of difficult circumstances.

Act. Wing Cdr. H. LAW-WRIGHT, D.F.C., R.A.F.V.R., No. 14 Sqn.—This officer has completed very many sorties and has displayed exceptional skill and tenacity. On a recent occasion he undertook an operation which entailed a flight lasting for ten and a half hours. His efforts throughout and the result achieved were worthy of the highest praise.

Second Bar to Distinguished Flying Cross

Act. Wing Cdr. C. F. GRAY, D.S.O. D.F.C., R.A.F.O.—Since the award of the D.S.O., this officer has destroyed a further five enemy aircraft, thus bringing his victories to 27 aircraft destroyed. He is an exceptionally able pilot and leader who has completed a long and arduous tour of operations, and has discharged his duties as wing commander, in the air and on the ground, in an exemplary and highly praiseworthy manner.

Bar to Distinguished Flying Cross

Act. Wing Cdr. G. R. MAGILL, D.F.C., R.A.F.O., No. 180 Sqn.—Wing Cdr. Magill, now on his second tour of operational duty, has taken part in a large number of most successful operations. On one occasion recently, with great skill and determination he flew his badly damaged aircraft safely home on one engine. An excellent squadron commander, his fine leadership has contributed in no small measure to the high standard of efficiency attained in the squadron.

Act. Wing Cdr. B. B. RUSSELL, D.F.C., R.C.A.F. —Since April, 1943, this officer has acted as Wing Leader. He has led his Wing on a large number of escort duties without the loss of a single bomber to enemy fighters. The high praise earned by the wing for its skill is largely due to the great devotion to duty and ability displayed by Wing Cdr. Russell.

Act. Sqn. Ldr. J. S. BELTON, D.F.C., R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.—As flight commander during a period of ten months, this officer has made a very important contribution to his squadron's success. During a recent raid while flying in very bad weather, one engine in his aircraft became unserviceable. By the exercise of determination and skill, however, Sqn. Ldr. Belton was successful in extricating his aircraft and crew from a perilous situation and in making safe landing at base.

Act. Sqn. Ldr. R. H. BUNKER, D.F.C., R.A.F.O., No. 9 Sqn.—Sqn. Ldr. Bunker has completed numerous sorties involving many hours of operational flying. As captain of aircraft, he has displayed a very high degree of courage and tenacity, together with determination to strike at the enemy wherever possible. As flight commander, he has evinced sterling qualities of leadership and devotion to duty. Since the award of the D.F.C. he has secured many successful photographs of target areas.

Act. Sqn. Ldr. H. B. MARTIN, D.S.O., D.F.C., R.A.F.V.R., No. 617 Sqn.—In September, 1943, Sqn. Ldr. Martin was detailed to participate in a low-level operation at night. Early in the engagement the leader of the formation was shot down, nevertheless, despite appalling weather, Sqn. Ldr. Martin with grim determination persisted in his effort to locate the target. The search lasted for 84 minutes in the target area, but Sqn. Ldr. Martin persisted until able to make an attack.

Flt. Lt. D. J. SHANNON, D.S.O., D.F.C., R.A.A.F., No 617 Sqn.—Flt. Lt. Shannon was recently detailed to complete a low-level operation. The weather in the target area was exceptionally bad and as a result he was unable to avoid flying through light anti-aircraft defences. In spite of this, he spent 40 minutes in the area and eventually located his objective and attacked it, though adverse weather had made bombing most difficult.

Act. Flt. Lt. H. A. HITCHCOCK, D.F.C., R.A.F.V.R., No. 97 Sqn.—During many effective bombing raids, the navigational skill displayed by this officer has contributed much to the success attained by his crew. Since the award of the D.F.C. he has participated in the recent raids on major German targets. In June, 1943, he was navigator in an aircraft detailed to attack Friedrichshafen, and by his accuracy and technical skill the target was attacked with precision at the right moment.

Act. Flt Lt. H. A. SCOTT, D.F.C., R.A.F., No. 109 Sqn.—This officer has a distinguished operational career. He completed his first sorties during the Battle of France and has recently taken part in a number of missions with this squadron. Since the award of the D.F.C. in February, 1943, he has continued to operate with skill and courage on many important bombing attacks, including three against Essen in March, 1943.

P/O. J. MCINTOSH, D.F.C., R.A.F.V.R., No. 207 Sqn.—Since the award of the D.F.C. this officer has completed several sorties of a hazardous and difficult nature, during all of which he has displayed outstanding determination. He has on several occasions secured excellent photographs. During a recent sortie to Berlin, his aircraft was attacked by an enemy fighter and set on fire. Despite this, P/O. McIntosh manœuvred the bomber in such a way as to enable his gunners to shoot down his assailant. Later he flew the damaged aircraft to a safe landing base.

Distinguished Flying Cross

Sqn. Ldr. A. I. S. DEBENHAM, R.A.F.V.R., No 10 Sqn.

Act. Sqn. Ldr. D. C. ANSET, R.A.F.V.R., No. 156 Sqn.

Act. Sqn. Ldr. A. H. G. CLARKE, R.A.A.F., No. 455 (R.A.A.F.) Sqn.

Sgt. H. A. Milne, No. 47 Squadron, who has been awarded the D.F.M.

Act. Sqn. Ldr. E. J. WIGHT, R.A.F.O., No. 224 Sqn.

Flt. Lt. B. AYTOUN, R.A.F.V.R., No. 619 Sqn.

Flt. Lt. A. G. CONWAY, R.A.F.V.R., No. 136 Sqn.

Flt. Lt. D. F. MACKENZIE, R.A.F.V.R., No. 97 Sqn.

Flt. Lt. A. L. WALKER, R.A.A.F., No. 466 (R.A.A.F.) Sqn.

Flt. Lt. W. W. WILSON, No. 455 (R.A.A.F.) Sqn.

Act. Flt. Lt. B. H. BERRIDGE, D.F.M., R.A.F.V.R., No. 97 Sqn.

Act. Flt. Lt. J. E. BLAIR, D.F.M., R.A.F.V.R., No. 97 Sqn.

Act. Flt. Lt. A. H. DURINGER, D.F.M., R.A.F.V.R., No. 101 Sqn.

Act. Flt. Lt. G. H. EBERT, R.A.F., No. 207 Sqn.

Act. Flt. Lt. G. H. T. HATTON, R.A.F.V.R.

Act. Flt. Lt. T. HODGKINSON, R.A.F.V.R., No 97 Sqn.

Act. Flt. Lt. B. E. MCLAUGHLIN, R.A.F.V.R., No. 12 Sqn.

Act. Flt. Lt. J. A. MOSS, R.A.F.V.R., No. 233 Sqn.

Act. Flt. Lt. R. C. RAWLINGS, R.N.Z.A.F., No. 158 Sqn.

Act. Flt. Lt. R. ROBERTS, R.A.F.V.R., No. 156 Sqn.

Act. Flt. Lt. E. M. THOMPSON, R.A.F.V.R., No. 156 Sqn.

Act. Flt. Lt. A. L. WEBBER, R.A.F., No. 89 Sqn.

Act. Flt. Lt. C. A. WILSON, R.C.A.F., No. 100 Sqn.

Act. Flt. Lt. H. W. N. WRIGHT, R.A.F.V.R., No. 48 Sqn.

Act. Flt. Lt. V. WOOD, R.A.F.V.R., No. 12 Sqn.

F/O. W. AULD, R.A.F.V.R., No. 51 Sqn.

F/O. K. J. BENNER, R.C.A.F., No. 44 Sqn.

F/O. J. T. EDWARDS, R.A.F.V.R., No. 12 Sqn.

F/O. G. A. FACEY, R.A.F.V.R., No. 89 Sqn.

F/O. W. J. HANKS, R.A.F.V.R., No. 158 Sqn.

F/O. F. R. KENNEDY, R.A.A.F., No. 156 Sqn.

F/O. J. W. LEITCH, R.A.A.F., No. 7 Sqn.

P/O. R. J. WELLS, R.A.F., No. 120 Sqn.

Act. Sqn. Ldr. M. W. BEVERIDGE, R.C.A.F., No. 418 (R.C.A.F.) Sqn.

Act. Sqn. Ldr. C. C. MORAN, R.C.A.F., No. 418 (R.C.A.F.) Sqn.

Flt. Lt. E. N. BUNTING, R.A.F.V.R., No. 604 Sqn.

Flt. Lt. A. G. PATSTON, R.A.F.V.R., No. 85 Sqn.

Act. Flt. Lt. M. A. CYBULSKI, R.C.A.F., No. 410 (R.C.A.F.) Sqn.

P/O. H. H. LADBROOK, R.A.F.V.R., No. 410 (R.C.A.F.) Sqn.

Act. Flt. Lt. J. D. MITCHNER, R.C.A.F., No. 402 (R.C.A.F.) Sqn.

F/O. R. M. MUTIR, R.A.F.V.R., No. 264 Sqn.

F/O. D. C. L. WEBBER, R.A.F.V.R., No. 120 Sqn.

Flt. Lt. R. T. PHIPPS, R.C.A.F., No. 272 Sqn.

F/O. G. A. S. WILLIAMS, R.A.F.V.R., No. 196 Sqn.

P/O. P. DYSON, R.A.F.V.R., No. 196 Sqn.

P/O. C. B. MEGONE, R.A.F.V.R., No. 603 Sqn.

Act. W/O. G. A. LINDSAY, R.C.A.F., No. 156 Sqn.

F/O. E. L. HARTLEY, R.A.F.V.R., No. 58 Sqn.

Sqn. Ldr. J. MARTIN, R.A.F.O., No. 622 Sqn.

Act. Flt. Lt. R. T. FITZGERALD, R.A.A.F., No. 77 Sqn.

Act. Flt. Lt. R. F. LOWN, R.A.F.V.R., No. 15 Sqn.

F/O. B. D. BAKER, R.A.F.V.R., No. 92 Sqn.

F/O. A. C. RICHARDS, R.A.F.V.R., No. 622 Sqn.

P/O. B. A. CONNOR, R.A.A.F., No. 149 Sqn.

P/O. W. HUMPHRIES, R.A.F.V.R., No. 199 Sqn.

P/O. B. A. NORTH, R.A.F.V.R., No. 149 Sqn.

W/O. J. MONTGOMERY, R.A.F., No. 149 Sqn.

F/O. A. M. DENWOODIE, R.A.F.V.R., No. 27 Sqn.

F/O. K. MCINTYRE, R.A.A.F., No. 7 Sqn.

F/O. D. M. MOODIE, R.C.A.F., No. 97 Sqn.

F/O. G. RICE, R.A.F.V.R., No. 617 Sqn.

F/O. C. A. SHIRLEY, D.F.M., R.C.A.F., No. 50 Sqn.

F/O. H. H. TAYLOR, D.F.M., R.A.F.V.R., No. 44 Sqn.

F/O. H. J. THOMAS, R.A.F., No. 426 (R.C.A.F.) Sqn.

F/O. C. L. WALSHAW, R.A.F.V.R., No. 10 Sqn.

F/O. I. WHITTAKER, R.A.F., No. 617 Sqn.

P/O. R. A. BAKER, R.A.F.V.R., No. 50 Sqn.

P/O. C. T. CROOK, R.A.A.F., No. 460 (R.A.A.F.) Sqn.

P/O. H. C. DOEL, R.A.F.V.R., No. 158 Sqn.

P/O. W. E. ELDER, D.F.M., R.N.Z.A.F., No. 76 Sqn.

P/O. E. F. HICKS, C.G.M., R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.

P/O. J. HUGILL, R.A.F., No. 102 Sqn.

P/O. J. R. HULLEY, R.A.F.V.R., No. 10 Sqn.

P/O. K. J. LAMBERT, R.A.F.V.R., No. 10 Sqn.

P/O. W. L. MCKAY, R.A.F.V.R., No. 158 Sqn.

P/O. W. T. MAYSON, R.A.F.V.R., No. 7 Sqn.

P/O. W. T. MOORE, R.A.F.V.R., No. 10 Sqn.

P/O. J. C. OTTER, R.A.F.V.R., No. 156 Sqn.

P/O. V. ROYLE, R.A.F.V.R., No. 10 Sqn.

P/O. B. C. SHERRY, R.A.F.V.R., No. 9 Sqn.

P/O. J. H. VERRALL, R.N.Z.A.F., No. 214 Sqn.

P/O. W. WILKINSON, R.A.F.V.R., No. 156 Sqn.

W/O. A. E. FLOWERDAY, R.A.F.V.R., No. 97 Sqn.

W/O. W. L. C. HICKLING, R.A.A.F., No. 156 Sqn.

W/O. G. PEARCE, R.A.F.V.R., No. 97 Sqn.

Act. W/O. R. J. BUNTEN, R.A.F.V.R., No. 103 Sqn.

Act. W/O. J. L. HANNAH, R.A.F.V.R., No. 97 Sqn.

Act. W/O. C. W. KNOX, R.A.A.F., No. 156 Sqn.

Act. W/O. E. W. RITCHIE, R.A.A.F., No. 156 Sqn.

Act. Sqn. Ldr. K. M. BARCLAY, R.A.A.F., No. 453 (R.A.A.F.) Sqn.

Flt. Lt. A. N. DAVIS, R.A.F., No. 16 Sqn.

Flt. Lt. R. F. N. PUGHE, R.A.F., No. 16 Sqn.

Act. Flt. Lt. A. DREW, R.A.F.V.R., No. 118 Sqn.

Act. Flt. Lt. R. D. PHILLIP, R.C.A.F., No. 421 (R.C.A.F.) Sqn.

F/O. D. H. ALCORN, R.C.A.F., No. 416 (R.C.A.F.) Sqn.

F/O. K. S. BUTTERFIELD, R.A.F.V.R., No. 276 Sqn.

F/O. D. A. GREVILLE-HEYGATE, R.A.F.V.R., No. 16 Sqn.

F/O. B. B. KENNETT, R.A.F.V.R., No. 464 (R.A.A.F.) Sqn.

F/O. A. G. NORMAN, R.A.F.V.R., No. 295 Sqn.

F/O. N. G. PAYNE, R.A.F.V.R., No. 464 (R.A.A.F.) Sqn.

F/O. J. BURNELL, R.A.F.V.R., No. 10 Sqn.

F/O. T. E. TRANTER, R.A.F.V.R., No. 10 Sqn.

P/O. H. T. SCOTT, R.A.A.F., No 460 (R.A.A.F.) Sqn.

P/O. W. L. TAYLOR, R.A.F.V.R., No. 10 Sqn.

Act. Sqn. Ldr. E. G. DEAN, R.A.F., No. 10 Sqn.

Flt. Lt. J. N. ROWLAND, R.A.F., No. 12 Sqn.

Act. Flt. Lt. J. V. PERRINS, R.A.F.V.R., No. 138 Sqn.

F/O. D. S. BELL, R.A.F.V.R., No. 161 Sqn.

Conspicuous Gallantry Medal

Flt. Sgt. E. E. DE JOUX, D.F.M., R.A.F.V.R., No. 102 Sqn.—Since being awarded the D.F.M. Flt. Sgt. de Joux has participated in many attacks against some of the enemy's most heavily defended and major targets such as Berlin, Cologne, Hamburg and Essen. An excellent air gunner, he has shot down five enemy night fighters and damaged two others.

W/O. C. E. WHITE, R.A.F.V.R., No. 100 Sqn. —On the night of October 20th, 1943, W/O. White and Sgt. Dowdell were pilot and navigator respectively of an aircraft detailed to attack Leipzig. Soon after leaving the airfield the intercommunication system became unserviceable, and later, after crossing the enemy coast, one of the bomber's engines became defective. Before the propeller could be feathered the engine burst into flames.

An extinguisher failed to put out the fire completely, and it burned sufficiently bright to illuminate the fuselage and tailplane. In spite of this, W/O. White flew on to the target and bombed it. On the homeward flight Sgt. Dowdell displayed exceptional skill and resource, and, in spite of great difficulties, unerringly guided his pilot to base. The defective engine was still alight when the airfield was reached, but W/O. White effected a masterly landing. As the bomber touched down the flames from the engine shot upwards and threatened to envelop the bomber, but W/O. White coolly ensured that his crew safely disembarked whilst he attended to the switches and petrol cocks.

Distinguished Flying Medal

Flt. Sgt. J. McP. WHITELAW, R.A.F.V.R., No. 216 Sqn.—For citation see Sqn. Ldr. FORSYTH, D.S.O.

Sgt. L. C. A. DOWDELL, R.A.F.V.R., No. 100 Sqn.—For citation see W/O. White, C.G.M.

Flt. Sgt. S. BOYLE, R.A.F.V.R., No. 44 Sqn.

Flt. Sgt. L. G. DAVIS, R.A.F.V.R., No. 61 Sqn.

Flt. Sgt. J. DUFFY, R.A.F., No. 97 Sqn.

Flt. Sgt. W. B. HAWKINS, R.A.F.V.R., No. 7 Sqn.

Flt. Sgt. W. A. HETHERINGTON, R.A.F., No 201 Sqn.

Flt. Sgt. (now W/O.) W. HILL, R.C.A.F., No. 97 Sqn.

Flt. Sgt. (now P/O.) K. J. P. HOLMES, R.A.A.F., No. 10 Sqn.

Flt. Sgt. J. HYDE, R.A.F.V.R., No. 207 Sqn.

Flt. Sgt. A. J. KENDALL, R.A.F.V.R., No. 10 Sqn.

Flt. Sgt. G. McCLELLAND, R.A.F.V.R., No. 10 Sqn.

Flt. Sgt. J. F. MERCHANT, R.C.A.F., No. 5 Sqn.

Flt. Sgt. R. MIDDLETON, R.A.F.V.R., No. 207 Sqn.

Flt. Sgt. I. H. NICHOLSON, R.A.F.V.R., No. 207 Sqn.

Flt. Sgt. W. E. A. READING, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.

Flt. Sgt. (now P/O.) J. D. RUDLING, R.N.Z.A.F., No. 136 Sqn.

Flt. Sgt. J. SIMMONS, R.A.F., No. 207 Sqn.

Flt. Sgt. C. A. STEWART, R.A.F.V.R., No. 9 Sqn.

Flt. Sgt. E. C. TEMPLE, R.A.F., No. 617 Sqn.

Flt. Sgt. L. L. J. THOMAS, R.A.F.V.R., No. 83 Sqn.

Flt. Sgt. A. E. WILSON, R.A.F.V.R., No. 61 Sqn.

Sgt. E. J. CARDEN, R.A.F., No. 423 (R.C.A.F.) Sqn.

Sgt. B. O. R. BAYS, R.A.F.V.R., No. 418 (R.C.A.F.) Sqn.

Flt. Sgt. K. E. LADDS, R.A.F.V.R., No. 58 Sqn.

Flt. Sgt. J. C. CHAPMAN, R.A.F., No. 156 Sqn.

Flt. Sgt. G. G. FORBES, R.A.F.V.R., No. 156 Sqn.

Sgt. C. G. JOHNSON, R.A.F.V.R., No. 27 Sqn.

Flt. Sgt. N. L. THOMAS, R.A.A.F., No. 15 Sqn.

Sgt. L. J. BENTLEY, R.A.F.V.R., No. 15 Sqn.

Sgt. D. A. LONG, R.A.F.V.R., No. 51 Sqn.

Act. Flt. Sgt. M. HEMMING, R.A.F.V.R., No 97 Sqn.

Act. Flt. Sgt. E. C. NIXON, R.A.F.V.R., No. 35 Sqn.

Act. Flt. Sgt. F. STRANGE, R.A.F.V.R., No. 97 Sqn.

Sgt. R. S. BENNETT, R.A.F.V.R., No. 97 Sqn.

Sgt. W. G. HILL, R.A.F.V.R., No. 12 Sqn.

Sgt. D. HILLYER, R.A.F.V.R., No. 61 Sqn.

Sgt. W. LAVERICK, R.A.F., No. 35 Sqn.

Sgt. L. A. LENOX, R.A.F.V.R., No. 158 Sqn.

Sgt. A. C. LORRIMORE, R.A.F., No. 101 Sqn.

Sgt. C. MACFARLANE, R.A.F.V.R., No. 10 Sqn.

Sgt. R. S. MINNETT, R.A.F.V.R., No. 10 Sqn.

Sgt. T. L. THACKRAY, R.A.F., No. 10 Sqn.

Sgt. K. D. WHITE, R.A.F.V.R., No. 50 Sqn.

Sgt. S. A. WHITE, R.A.F., No. 61 Sqn.

Flt. Sgt. J. DOYLE, R.A.F.V.R., No. 464 (R.A.A.F.) Sqn.

Sgt. C. ANDERTON, R.A.F.V.R., No. 118 Sqn.

Sgt. J. P. GRANT, R.A.F.V.R., No. 295 Sqn.

THE KING has been graciously pleased to approve the following awards:—

B.E.M. (Mil.)

L.A/C. H. T. COLLINS, R.A.F.V.R., No. 104 Sqn.—One morning in July, 1943, while a petrol bowser was being refuelled, the pumping motor backfired and started a fire in the bowser, which contained about 850 gallons of 100-octane fuel and which was surrounded by a large number of 40-gallon drums filled with petrol. The bowser burned fiercely and showed signs of exploding and igniting the entire fuel dump. L.A/C. Collins ran to the scene and assisted in rolling the nearest drums to a safe distance. Then, despite the great heat which had deterred other helpers, he crawled under the lorry, where the rear tyres were burning, unhooked the towing bar, and then drove the lorry away. In so doing L.A/C. Collins prevented the conflagration from spreading to the main fuel dump and saved the lorry from destruction.

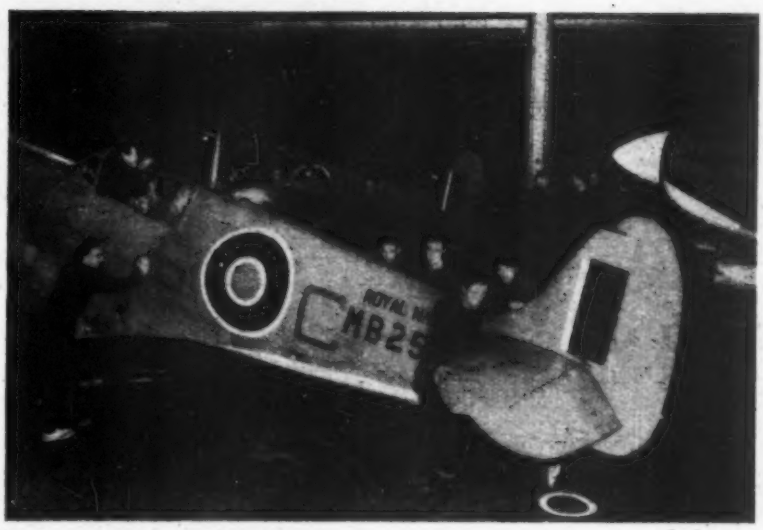
L.A/C. G. R. THOMPSON, R.A.F.V.R., No. 58 Sqn.—In August, 1943, this airman was working in an aircraft which had been fuelled and loaded with depth charges. An explosion occurred which set fire to the starboard side of the fuselage. L.A/C. Thompson immediately left the aircraft and, having procured a fire extinguisher, re-entered it and succeeded in quelling the flames. This airman's prompt and gallant action in returning to the aircraft, knowing that it was loaded with high explosives, is worthy of high praise.

Roll of Honour

Casualty Communiqué No. 325.

THE Air Ministry regrets to announce the following casualties on various dates. The next-of-kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names on the list 103 are second entries giving later information of casualties published in earlier lists.



BELOW DECKS: Handling Seafires on the hangar deck of aircraft carrier H.M.S. *Indomitable*.

Royal Air Force

KILLED IN ACTION.—Sgt. I. W. Colvin; F/O. W. D. Cooper; Sgt. C. D. Curd; Sgt. R. Davies; Sgt. R. E. Gratwick; Sgt. T. J. Kelly; Sgt. K. E. M. Marsh; Sgt. J. O'Reilly; Act. W/O. R. P. Rabett; Sgt. T. Roberts; F/O. P. C. Simpson; F/O. J. H. Spark; Sgt. E. J. Stickland; Sgt. S. E. Tilley.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. C. Askham; Sgt. J. H. Body; F/O. E. R. Cullf; P/O. G. H. Dane; Sgt. T. A. Dew; P/O. W. D. Hawkes; Sgt. J. Smith; Sgt. E. S. Tompkins; Sgt. A. C. A. Veeck; Sgt. H. R. Wilmore.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. L. F. Axby; Flt. Sgt. C. Burkill; F/O. R. V. Dawes; Sgt. A. D. Dinnis; F/O. H. D. Dixon; Sgt. A. G. Dymick; Sgt. L. C. Ehrhart; Sgt. J. F. Farrelly; Sgt. H. Fell; Flt. Sgt. L. Fieldhouse; Sqn. Ldr. F. T. Flower; Sgt. J. M. Freshwater; Sgt. W. Illingworth; Flt. Sgt. E. L'E. Lightfoot-Shandley; Sgt. D. McEwen; Sgt. W. W. Moss; Sgt. S. W Patton; Act. Flt. Sgt. F. W. T. Routledge; F/O. F. A. Southon; P/O. G. Stephens; P/O. K. A. Taylor; Sgt. E. G. Thomas; Sgt. D. A. Watkins; P/O. T. G. Watson; Sgt. C. G. West; Sgt. R. Woodhall.

WOUNDED OR INJURED IN ACTION.—Sgt. A. J. Allaway; Flt. Sgt. J. E. Baker; Flt. Sgt. V. R. H. Hobbs.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. W. T. Barnes; Flt. Sgt. J. D. Bradford; Sgt. W. R. Bray; F/O. C. H. Cleveland; Sgt. T. Davies; Sgt. G. Douglas; Sgt. F. Ellick; Sgt. H. Exley; Act. Flt. Lt. G. Hamilton; Sgt. D. T. Hand; Sgt. L. Hare; Sgt. N. T. Harris; Sgt. A. S. Haxton; Sgt. R. Hurrell; Sgt. F. C. Jackson; Sgt. J. I. Jones; P/O. W. F. C. Knight; Flt. Sgt. J. R. McIntosh; Flt. Sgt. H. G. Mitchell; F/O. G. E. M. Parker; Sgt. C. G. Perides; Sgt. A. C. Petre; Sgt. L. A. Sim; Sgt. R. Steventon; F/O. S. J. H. Verney; P/O. N. P Wardman; Sgt. A. H. W. Warrell; Sgt. N. J. E. Wheeler; Sgt. R. E. Woodford; Flt. Sgt. R. A. Zahl.

MISSING.—Sgt. D. E. Ashton; Sgt G. G. Attwood; Sgt. G. F. Austin; Sgt. R. Barlow; Sgt. R. Bishop; Sgt. J. Black; Sgt. J. Brett; Sgt. A. H. Brownlie; Flt. Lt. J. N. G. Bruce; P/O. R. E. H. Burton; Sgt. D. W. H. Butterfield; Sgt. D. R. L. Crapper-Bovey; Sgt. D. G. St. J. Davies; Sgt. R. O. Evans; Sgt. W. L. Fulton; Act. Flt. Lt. A. L. Furr; Sgt. S. J. Harris; Sgt. G. A. Hayes; Sgt. L. Hockey; Sgt. J. McG. Hughes; Act. F/O. G. G. Hurst; F/O. I. R. Hyde; Sgt. H. J. W. Hynds; Sgt. J. Jackson; Sgt. E. C. Kent; Sgt. S. T. Kettlety; Sgt. J. Kirby; Sgt. P. G. Kirby; Sgt. R. Large; P/O. G. A. Lawrenson; Wing Cdr. R. M. Longmore, O.B.E.; Flt. Lt. C. A. McGaw; Sgt. J. McGovern; Sgt. J. McGuirk; Sgt. D. McLean; Sgt. L. A. McLeod; Sgt. J. E. McQuade; Sgt. J. Malleber; Sgt. E. T. G. Moody; Sgt. C. S. Nelson; Sgt. T. T. O'Leary; Sgt. E. Otter; Flt. Sgt. A. E. Parsons; Sgt. T. G. C. Pugh; P/O. D. Ridgeway; Sgt. B. Ridsdale; Sgt. A. Robinson; Sgt. A. F. Simpson; Sgt. J. Sneddon; P/O. L. Stevenson; Sgt. D. H. Strong; F/O. R. W. Tait; Sgt. A. Taylor; Sgt. B. Thorpe; Sgt. G. Todkill; P/O. D. Wares; Sgt. R. A. Waters; Flt. Sgt. J. F. Wheatley; Act. Flt. Lt. K. R. Yates; Sgt. J. A. Young.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. R. A. Mushet.

KILLED ON ACTIVE SERVICE.—Sgt. E. J. Andrews; Sgt. T. H. Clapp; Sgt. J. Hall; L.A/C. H. F. Hughes; Sgt. S. Otty; Sgt. A. J. Tait.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. O. R. Jolly.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. J. E. O. Jones.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. H. Featherstone; Flt. Sgt. C. Rumble.

DIED ON ACTIVE SERVICE.—Cpl. I. Alderson; L.A/C. D. H. Bristow; Cpl. E. E. Bromwich; Sgt. J. E. Brumwell; L.A/C. B. T. Cookman; L.A/C. H. Davies; A/C.2 D. W. S. Edwards; A/C.1 C. R. Findlay; A/C.1 A. Harrison; L.A/C. J. A. Lonsby; L.A/C. A. Medlicott; A/C.1 A. E. Moore; L.A/C. J. R. Paget; Act. Cpl. R. J. Parkins; Sgt. R. J. Rider; L.A/C. F. Woosnam.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. A. C. MacMillan.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. O. S. Filmer; Sgt. N. S. Forrester; Flt. Sgt. J. I. Thompson; P/O. C. C. Truman.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. J. Coulthard.

MISSING, BELIEVED KILLED IN ACTION.—P/O. P. L. R. Lloyd; P/O. A. S. Mitchell; Flt. Sgt. J. Price; Flt. Sgt. D. J. Rowan.

MISSING.—Act. Flt. Lt. K. T. Balding; Flt. Sgt. W. F. Fitzgerald; W/O. E. A. Mincham; Sgt. J. E. Nixon; W/O. W. Stott; Flt. Sgt. T. P. Walton.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. C. J. Brown.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. A. G. Bicknell.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. F. Bartkiewicz; Sgt. J. J. De Marco; P/O. E. C. Halliding; Sgt. L. Nutik; F/O. H. K. Pollock; Sgt. H. Robel.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. F. C. Bitten; W/O. L. W. Brayford; P/O. T. S. Briggs; Sgt. A. G. G. Brown; Sgt. H. L. Brown; F/O. O. R. Brown; Sgt. G. M. Caldwell; P/O. T. E. Case; Flt. Sgt. G. G. Clark; F/O. S. McI. Connacher; Flt. Sgt. J. D. Correll; Sgt. J. C. M. Desrosiers; Flt. Sgt. T. I. M. Edwards; Sgt. H. G. N. Fisher; Sgt. C. St. C. Foster; Flt. Sgt. J. J. Gendron; Sgt. R. E. Goldney; Sgt. J. J. Goldspink; Flt. Sgt. W. R. Gray; Flt. Sgt. B. F. Hargrove; Act. Flt. Lt. V. H. Harris; F/O. C. B. Haslam; Flt. Sgt. K. J. Hodgson; Sgt. R. B. Honeycombe; Sgt. H. A. Horton; Sgt. D. G. Ide; Sgt. D. W. Johnson; Sgt. W. F. Jordon; P/O. J. P. Kavanagh; Sgt. W. B. Kenny; F/O. W. K. Komaiko; Sgt. L. A. J. Latour; Flt. Lt. J. H. Long; P/O. D. McBeath; Sgt. G. McGrath; F/O. W. D. B. Marks; Flt. Sgt. F. T. Mattison; F/O. J. W. Millar; P/O. J. C. Monteith; Flt. Sgt. K. M. Perkins; Flt. Sgt. J. A. A. Poirier; Sgt. J. Prosnycek; Sgt. W. A. Robinson; Sgt. H. B. J. Sargent; Flt. Sgt. J. F. Sayers; Flt. Sgt. D. E. Seeley; P/O. A. Storey; Sgt. J. A. C. Taylor; P/O. P. Y. C. Tremblay; P/O. H. Welch; P/O. A. L. Weller; Sgt. R. P. Wilson; Flt. Sgt. K. I. Young.

WOUNDED OR INJURED IN ACTION.—P/O. J. W. Maxwell; Flt. Lt. P. S. Warren.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. D. C. Bridgman.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. W. G. Bailey; F/O. C. M. Butcher; Flt. Sgt. P. S. Camsell; Flt. Sgt. R. G. Christie; Sgt. E. S. Driscoll; Flt. Lt. D. M. Grant, D.F.C.; Sgt. J. M. Morrison; F/O. C. H. Popplewell; Flt. Sgt. F

SERVICE AVIATION

Sheehan; Flt. Sgt. B. D. Winders; P/O. E. M. Wood.

MISSING.—Flt. Sgt. D. C. Baker; Sgt. R. A. Barr; P/O. A. F. Bell; P/O. R. K. Clements; F/O J. G. Connor; Sgt. A. J. Copegog; Sgt. G. A. E. Dean; Flt. Sgt. E. C. Ecclestone; P/O. J. E. Fisher; P/O. W. H. Fuller; P/O. R. Greaves; P/O. F. J. S. Guppy; F/O. M. P. Halpin; F/O. W. N. Hamilton; F/O. E. J. Hepburn; W/O. C. N. Hurl; Sgt. J. N. E. R. Labelle; Flt. Sgt. J. G. McInnes; W/O.2 B. H. MacIsaac; Sgt. W. E. McKee; P/O. E. D. MacMurchy; F/O. F. T. Manners; Sgt. D. W. Matthews; Sgt. L. A. Pinchless; Sgt. J. H. F. Rousseau; Flt. Lt. P. A. Shelton; F/O. R. H. Sherback; Sgt. R. H. Smith; Flt. Sgt. A. D. Steels; Sgt. D. B. Stone; Flt. Sgt. G. W. Thompson; P/O. E. P. Twiname; Flt. Sgt. M. D. Tymchuk; Sgt. M. N. Vitch; F/O. F. M. Webber; F/O. A. E. Wyton.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. D. S. Champion.

KILLED ON ACTIVE SERVICE.—Sgt. D. Crossland; Flt. Sgt. E. M. Mills; Sgt. W. G. Parker; Sgt. F. H. Partridge.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. J. B. J. de Macedo; P/O. K. R. Henry.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. W. J. McCoombs.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Sgt. M. Ridland.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. R. Campbell.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. R. A. Johnson.

MISSING.—F/O. N. L. Burton; W/O. D. K Cotterill; F/O. I. W. Hall.

South African Air Force

MISSING.—Capt. E. A. Rorvik.

Casualty Communiqué No. 326

Of the names in this list, 99 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—P/O. P. R. Andrews; Flt. Lt. D. T. Baker; Sgt. K. A. Brown; Sgt. D. O. Collen; Flt. Sgt. E. J. Dutton; Sgt. M. C. Lye; Sgt. J. I. McCullagh; F/O. C. L. Moody; Sgt. P. J. Moore; Sgt. F. W. Parkin; Sgt. J. H. Procter; Sgt. M. Simpson; Sgt. G. Sinclair; Sgt. F. J. Trower; W/O. D. H. Welch.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. B. Browne; Sgt. H. C. Ellis; P/O. L. J. Ellis; Flt. Sgt. N. Gillies; Sgt. R. C. Hall; Sgt. J. F. Hinds; Sgt. R. L. Le Page; Sgt. H. J. Morris; L.A/C. W. L. Purkiss; Sgt. L. R. Smith; Sgt. F. Warburton; Sgt. W. H. Wild.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. F. Arrowsmith; F/O. F. E. Ayers; P/O. L. M. Bridger; Sgt. W. R. Cook; F/O. M. J. Cowan; F/O. G. R. Dale; Sgt. P. G. Eames; Sgt. J. W. C. Evans; Sgt. I. Francis; Flt. Sgt. C. Hanstock; F/O. J. B. O'C. Huggard; Sgt. F. Hughes; Flt. Sgt. J. H. Hughes; Sgt. E. G. Hunt; Sgt. H. G. Jenkins; Sgt. R. McLean; Sgt. F. McNulty; Flt. Sgt. J. T. McRae; Sgt. J. Mues; Sgt. J. Park; Sgt. H. Precious; F/O. H. Ramsey; Sgt. W. M. D. Richards; Sgt. A. G. Sawyer; P/O. E. G. Shreeves; Flt. Sgt. B. K. Skinner; P/O. L. G. O. Smith; P/O. G. R. Tart; Sgt. J. M. Thom; P/O. C. G. Tilson; Act. Sqn. Ldr. A. S. Turnbull; Sqn. Ldr. H. D. Venables; Sgt. S. Wescombe; Sgt. R. C. White; W/O. P. N. B. Williams.

WOUNDED OR INJURED IN ACTION.—Sgt. R. A. Barrett; Sgt. P. H. Finnegan; Sgt. J. D. Game; Sgt. J. P. O'Neill; Sgt. R. Whittaker.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. P. D. Bainton; Sgt. C. N. Boutle; Sgt. T. W. Chambers; Sgt. A. N. Griffiths-Buchanan; Sgt. H. J. F. Humphries; Sgt. F. G. McVey; Flt. Sgt. L. T. Needham; P/O. W. H. Scott; Sgt. H. C. Seymour; Sgt. J. Simpson; Sgt. S. Smith; Sgt. G. H. Styler; Flt. Lt. P. A. S. Woodwark.

MISSING.—Sgt. G. C. Bangs; Sgt. S. C. Barlegs; Sgt. N. Beer; Sgt. A. E. Bertram; Sgt. C. C. Bishop; Sgt. G. Blake-Hales; Sgt. S. K. Blandford; Sgt. F. H. Bloomfield; Flt. Sgt. W. G. Blue; Sgt. K. L. Brindley; Sgt. J. Bruce; Flt. Sgt. J. T. Bundle; Sgt. A. B. Burton; F/O. F. J. Chapman; Flt. Sgt. H. W. N. Clausen; Sgt. F. Cobley; Sgt. J. J. F. Collins; Flt. Lt. G. C. Cooper; Sgt. S. Cossey; Flt. Lt. E. W. Court; P/O. J. E. Cox; Sgt. W. H. Currier; Sgt. D. E. Day; F/O. J. L. Deans, D.F.C.; Sgt. D. Demaine; Sgt. A. MacD. Dick; Sgt. G. W. Dillnutt; Act. Flt. Sgt. L. A. Drummond; Sgt. J. Evans; P/O. C. Fifth; Sgt. D. Ford; Sgt. W. K. Fraser; F/O. J. H. L. German; Sgt. J. W. Grain; Act. Flt. Lt. J. G. Griffith, Sgt. M. Griffiths; Flt. Sgt. J. E. Grout; P/O. P. Hanavan; Sgt. J. F. Hoban; Sgt. O. W. D. Hodges; Sgt. A. Holloway; Flt. Sgt. F. A. Hughes; F/O. F. P. Humphries; Sgt. M. Jones; Flt. Sgt. A. A. King; Flt. Sgt. R. A. Lewis; Act. W/O. D. H. Loop; Sgt. T. McDonnell; F/O. G. E. A. Madgett; Flt. Sgt. J. A. Mallinson; P/O. R. P. Mantle; W/O. A. M. Marshall; Act. Sqn. Ldr. L. P. Massey, D.F.C.; Sgt. J. Maxton; Sgt. A. J. F. May; Sgt. L. E. Melbourne; Sgt. D. W. Miller; Act. Flt. Lt. R. W. G. Moore; F/O. M. Mulligan; Sgt. L. Newnes; Sgt. L. W. Noton; Sgt. A. A. Oliver; Sgt. A. G. Osborne; Sqn. Ldr. C. W. Passy, D.F.C.; Sgt. E. G. Pilbeam, Sgt. E. J. Plumridge; Flt. Sgt. R. A. Powrie; F/O. J. C. Pyne; Flt. Sgt. J. L. Ridsdale; Flt. Lt. J. B. Sands; P/O. K. Shaw; Flt. Sgt. A. Simpson; Sgt. F. G. Smith; F/O. S. Smith; F/O. S. D. Smith; Flt. Sgt. T. E. Stamp; Sgt. R. V. Street; Flt. Sgt. H. Telford; Sgt. W. H. Thornhill; Sgt. R. Thorogood; P/O. L. T. Thurlby; Sgt. R. K. Triggol; Sgt. J. E. Wadsworth; Sgt. K. W. Walker; Sgt. K. L. Wallace; P/O. G. H. Ward; P/O. A. L. Warner; Sgt. G. M. Weighell; Sgt. J. A. Whitehead; Sgt. J. T. Wigley; Sgt. J. Williamson; P/O. A. G. Witt.

KILLED ON ACTIVE SERVICE.—Sgt. W. G. Bougourd; Sgt. D. P. Burton, Sgt. L. F. Collins; Cpl. S. Collins; Sgt. G. A. Dixon; P/O. A. L. Gray; Sgt. J. Hargreaves; F/O. R. A. Johnstone; P/O. D. R. King; Sgt. J. L. Lane; Sgt. P. H. Mackintosh; W/O. I. K. Nicoll; Sgt. K. Reid; P/O. L. R. V. Sibley.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Act. Flt. Lt. E. Cook; P/O. P. E. Shaw.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. L. V. Beesley.

DIED ON ACTIVE SERVICE.—Sgt. L. J. Abbott; L.A/C. F. C. Addis-Bennett; F/O. J. H. Begg; L.A/C. T. P. Carling; A/C.2 G. Elder; L.A/C. A. F. Foster; Act. Flt. Lt. C. G. Hill; A/C.1 L. V. Howell; A/C.1 G. R. Ingham; L.A/C. R. P. Smith; Cpl. T. R. Smith; L.A/C. R. W. White; Sgt. F. H. Witcher.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. N. A. Fearneyhough; Sgt. J. Kilfoyle; F/O. D. Milmine; Sgt. K. R. Newton; Sgt. T. E. Stockton; Sgt. A. M. Winter.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—Cpl. E. M. Smith.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. W. H. Morrison.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. A. F. Neale.

WOUNDED OR INJURED IN ACTION.—F/O. C. S. Prictor.

MISSING, BELIEVED KILLED IN ACTION.—F/O. H. M. Parker.

MISSING.—Flt. Sgt. R. M. Edmonds; P/O. G. P. Godwin; Flt. Sgt. R. J. Pauli; P/O. H. E. M. Plant; Flt. Sgt. L. S. Smith.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. R. Burton.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. S. J. Lloyd.

COMING IN TO LAND : A Short Stirling silhouetted against a dawn sky as it returns from night operations.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. S. Allen; P/O. F. V. Breen; P/O. E. H. Bullis; P/O. S. Dubowski; P/O. W. J. Fisher; Sgt. H. E. Miles; P/O. W. K. Redman; Sgt. H. B. Sigel.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. C. W. G. Burke; W/O. D. B. McPhail; Flt. Sgt. J. F. Smith.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. R. L. Baumgarten; F/O. G. R. Bing; P/O. F. W. Buck; Sgt. R. T. Crimmins; Sgt. J. S. Fayle; Flt. Sgt. R. W. Ferrier; Sgt. A. E. Hatch; Sgt. C. C. Hildreth; Flt. Sgt. A. L. Home; Sgt. D. R. Horwood; Sgt. L. N. Jonasson; Flt. Sgt. J. M. Joynt; Sgt. M. G. T. Levins; Flt. Sgt. L. N. McArthur; F/O. C. A. McKinnon; Sgt. I. G. McLeod; P/O. H. C. MacNeil; Sgt. F. A. McNutt; W/O. J. D. Massey; P/O. R. W. Neill; Sgt. M. H. Nesbitt; F/O S. W. Pearce; Sgt. R. C. Ramsay; Sgt. G. W. F. Reynolds; Sgt. F. O. Ross; P/O. E. B. Ruto; F/O. M. K. Sexton; Sgt. H. A. Sheehan; Sgt. D. B. Smyth; Sgt. E. R. Springham; P/O. H. A. Tennis; Act. Flt. Lt. W. L. Turner; Flt. Sgt. J. S. Vose; F/O. G. H. Wheeler; Flt. Sgt. L. E. White.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. H. P. Boness; Act. Flt. Lt. P. T. Sargent; P/O. C. B. Steeves.

MISSING.—Flt. Sgt. P. Belkin; F/O. J. M. David; P/O. H. J. Gould; Sgt. J. P. Healey; P/O. J. W. O. R. Le Brock; P/O. G. H. Markle; Sgt. G. Molnar; Act. Flt. Lt. D. McN. Moodie; P/O. A. W. Porter; Flt. Sgt. E. F. A. Rowe; P/O. L. A. Titof, Flt. Sgt. C. N. D. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. N. Butts.

KILLED ON ACTIVE SERVICE.—P/O. W. J. Caulfield; Sgt. J. K. Fraser; Flt. Sgt. V. K. Harris; P/O. G. Hoopchuk; P/O. G. E. J. McCabe; Sgt. A. McGurty; Sgt. J. G. Sherk; Flt. Sgt. W. E. Smillie; P/O. J. S. Spencer.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. J. D. Dickson D.F.C., D.F.M.

Royal New Zealand Air Force

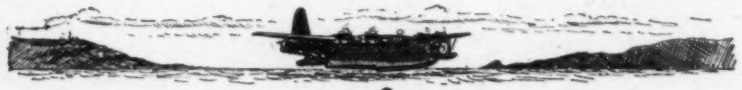
PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. R. F. Bennett; F/O. S. McGowan; Sgt. C. R. Smith.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. K. H. Blincoe; Sgt. G. W. Cook; Sgt. D. Durham.

South African Air Force

KILLED ON ACTIVE SERVICE.—Lt. M. F. Weitz.

Official Correction

Casualty Communiqué No. 310.

Under "KILLED ON ACTIVE SERVICE" for Act. Sqn. Ldr. R. C. Dafforn read Act. Sqn. Ldr. R. C. Dafforn, D.F.C.